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Lard Cheese.

The following statements with regard to the use of lard in cheese making were made recently at Albany by Assemblyman Crapser, of St. Lawrence county, before the Assembly Committee on Public Health:

The main elements in cheese manufactured from milk are caseine and fat. Rennet is used to coagulate. It is necessary to add oil if a richer cheese is wanted. We have never been able to do it in this country until recently. Lard is now substituted in place of cream or butter oil. To 100 pounds of milk we add 1½ pounds of lard, and have to buy the best lard we can. We get it at Chicago or elsewhere, and it has to be deodorized by heat in the usual way. Steam-rendered lard is better than kettle-rendered. By the new process it requires six to eight hours to render it. One would get 4 pounds of cream from 100 pounds of milk, and this 4 pounds is one-third caseine, so that about 2 pounds out of 100 is real oil. Therefore, 100 pounds of skim milk and 1½ pounds of lard will make 10 pounds of cheese. It makes a good quality of cheese. We have been able to sell all we could make. We make salable cheese out of skim milk, and so benefit farmers.

This new cheese is made from sweet milk, from which cream has been removed at 40° F., after standing twelve hours. No chemicals are used in this process, except some coloring matter, which we make. I have twenty-one factories, and have put them to making lard cheese as fast as possible. We have to work on the sly, but the honest farmer would not take any advantage. We got along with them by paying more for their milk than it is worth. Seven of my factories are now making the lard cheese, which goes to Chicago, Boston, New York, and Baltimore. The fact that it was made of lard sold the goods. The skim cheese factories in St. Lawrence use chemicals. I skimmed mine so close for butter that it could not make salable cheese. This kind of cheese we can sell to the middle classes, but not to the millionaires. Lard can be treated by difference of temperature and not be injured like butter. To deodorize the lard we blow hot steam through it. We manufactured 2,500 boxes of 60 lb each last year.

THE artesian well in Providence street, Boston, has been sunk about 1850 feet. It is believed that the well can now easily deliver from 300,000 to 400,000 gallons of water a day

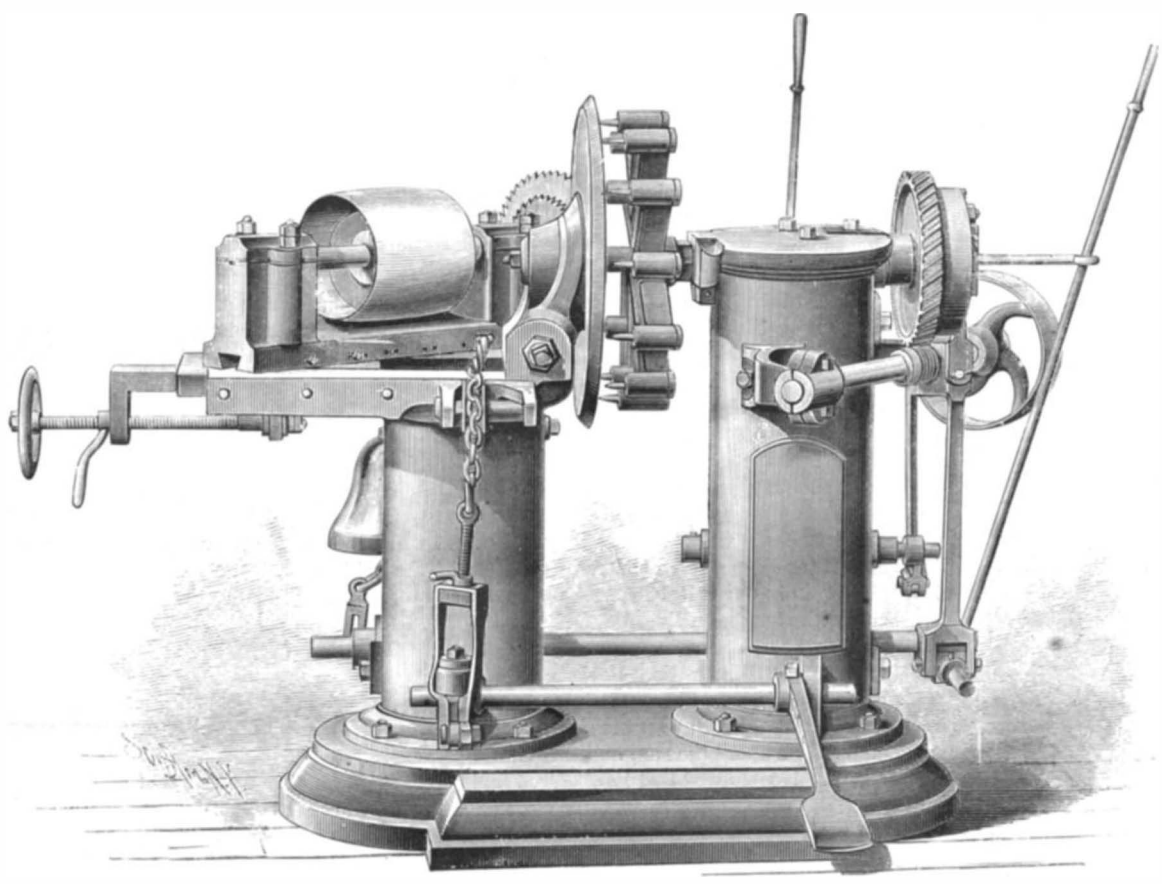

Fig. 1.—MACHINE FOR ROUNDING HEADS.

BARREL MACHINERY.

In our issue of Feb. 19 we described several improved machines made by Messrs. E. & B. Holmes, of Buffalo, N. Y., to be used in the manufacture of barrels. We are now able to present our readers with engravings of other machinery made by this firm and applied to the same manufacture.

This firm make a machine for dressing rived heading of all sizes for beer, oil, sirup, spirit, and other casks in which rived heading is used. The machine receives the heading in its roughest condition, takes out all of the winds and crooks, and prepares it at the rate of three thousand pieces per day for jointing and dowel boring. This is done on the combined heading jointer and fan, which delivers its shavings at any desired point. Fig. 2 shows a plain heading jointer.

The heads after being dressed, jointed, bored, and put together are made either truly circular or elliptical by the head rounding machine, shown in Fig. 1. This machine is fed by an attendant, but it turns and discharges the head automatically, while another head is being taken up to place in the machine. An important feature of this machine is an attachment for giving to the head a slightly oval form to compensate for the shrinkage and compression of the material.

The operation of this attachment is entirely automatic. This machine forms the heads rapidly, and is adapted to heads of different sizes and thicknesses. It completes the machine work on parts of the cask, but machines are provided by Messrs. E. & B. Holmes for doing much of the subsequent work of putting together and finishing.

Fig. 4 shows a machine for leveling kegs and small casks. This machine drives all of the truss hoops at once on kegs

[*Continued on page* 178.]

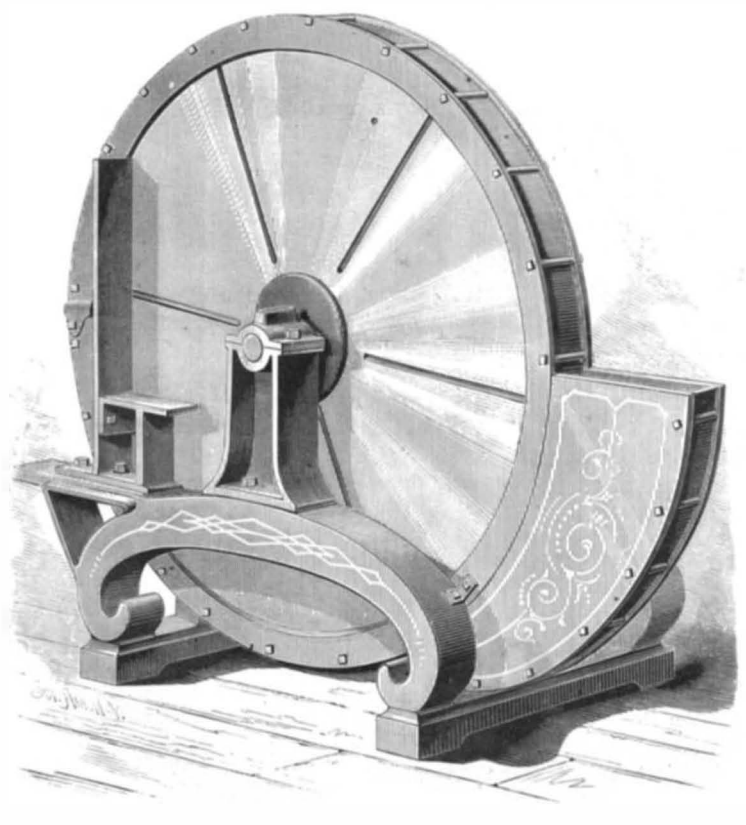

Fig. 2.—MACHINE FOR JOINTING HEADING.

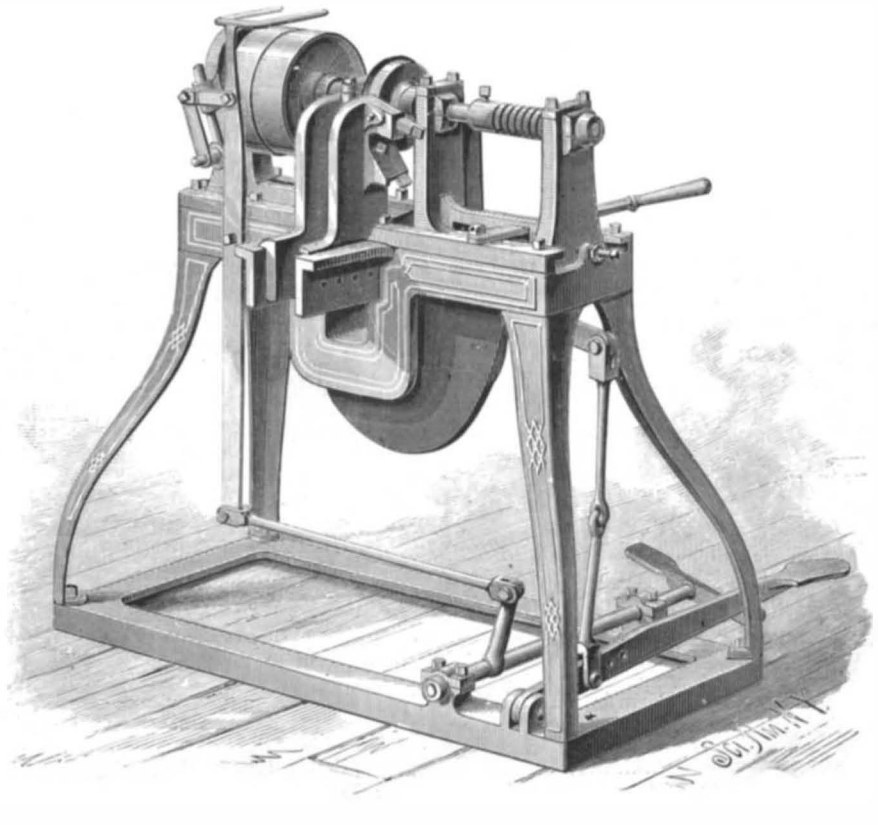

Fig. 3.—MACHINE FOR TURNING THE HEADS OF KEGS.

BARREL MACHINERY MADE BY E & B. HOLMES. BUFFALO, N. Y.

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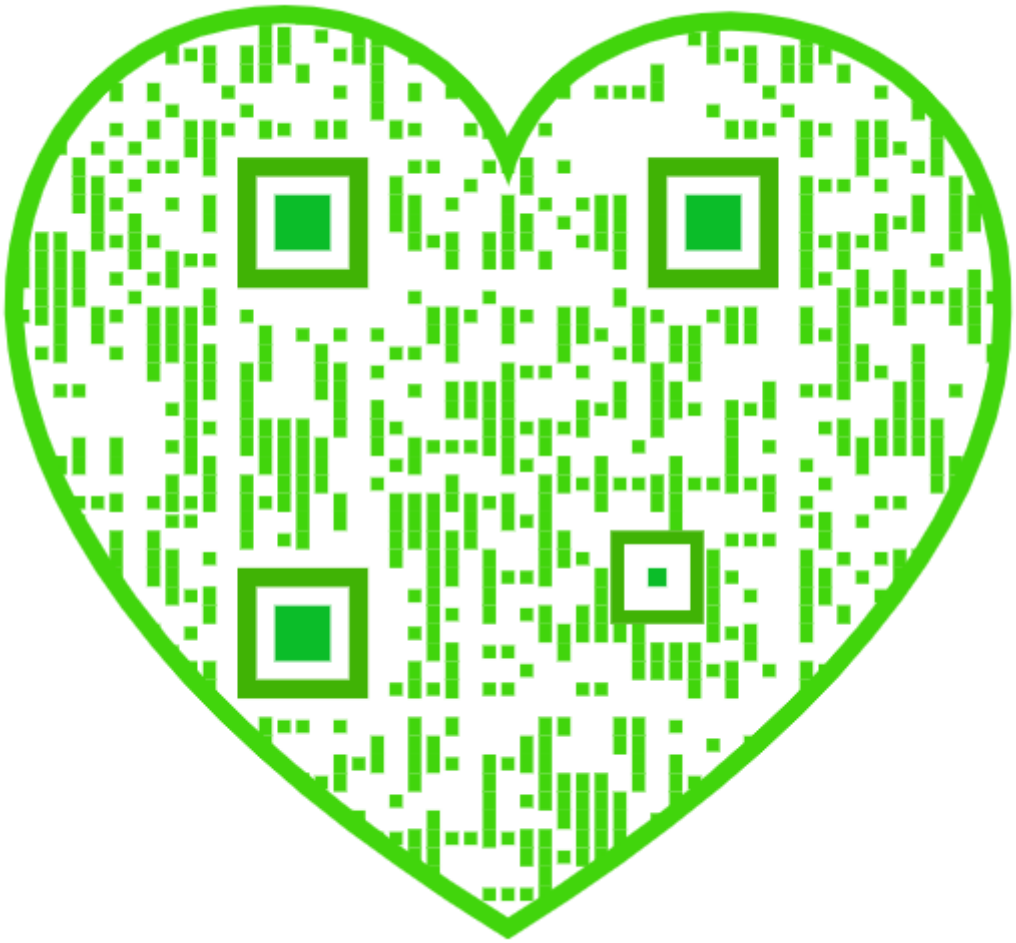

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NEW YORK, SATURDAY, MARCH 19, 1881.

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THE ZODIACAL LIGHT.

On almost any clear moonless night now this phenomenon may be noticed in the western sky. In the early part of such an evening, after the twilight has disappeared, a triangle of faint light will be seen extending up into the sky. Its base will be found about the place on the horizon where the sun disappeared, and may be of considerable, though of varying and somewhat indefinite width. It will taper upward and gradually fade out about half way from the horizon to the zenith, although it has been observed extending through ninety degrees, and even entirely across the sky. Its edges are so indefinite that no two observers will agree as to just what its limits are. It is not generally noticed, because it looks so much like an extension of twilight that it is mistaken for that. But, as has been said, it is to be seen when the twilight has entirely disappeared, and its shape is so different that any one can distinguish it. It is found to lie along the ecliptic, that is, the sun's path in the heavens. The ecliptic is more nearly perpendicular to the horizon during the evening now than during the evenings of any other part of the year. A glance at any celestial globe, or at a terrestial globe having the ecliptic marked upon it, will make this perfectly clear.

If such a globe be set for the 1st of March and for a northern latitude, then turned over toward the west, it will be noticed at about eight o'clock that the ecliptic is nearly perpendicular to the horizon, and passes close by the zenith, the point in the sky directly overhead. As the zodiacal light always lies along the ecliptic, and is close to the sun, it is clear that about the 1st of March affords the most favorable evenings for its observation; it then extends farthest up into the sky. In the latitude of the north United States its path does not run directly toward the zenith, for the ecliptic never runs through our zenith, but to a point a little way south of that. In fact it extends up toward the noonday position of the sun in the longest summer days. The globe will also show that at an hour or more *before* sunrise the ecliptic is nearly perpendicular to the horizon, and hence rises highest in October. The zodiacal light is thus seen best in the early morning in October. Except at these seasons it stretches along the sky so near to the horizon that it is generally unnoticed. The present is, then, the most favorable time of year for evening observation of this curious phenomenon, and for several weeks any one may find it. It will not do to expect too close a resemblance to the cuts of the light usually given in our text books. They make it more distinct and with sharper outlines than it will be found to have in the sky, as well as too narrow for its ordinary shape. The cause of the zodiacal light is still uncertain. From its nearness to the sun, and its position along the ecliptic, its origin must be sought for about the sun. Kepler ascribed it to an atmosphere about the sun, and this view was generally held until Laplace showed that its observed limits were far beyond the point where centrifugal force would balance the force of the sun's gravity, and that it could not be an atmosphere belonging to and revolving with the sun in any such sense as our atmosphere belongs to the earth. Prof. Wright, of Yale College, has shown by means of the spectroscope that the zodiacal light is *reflected sunlight*. But this does not determine the nature of the reflecting substance. It may be a cloud of gaseous matter, or possibly of small particles of solid matter, surrounding the sun and extending out upon all sides toward the earth's orbit. More probably it is due to immense swarms of meteoroids surrounding the sun, and thus reflecting its light to the eye. G. M. P.

WHOSE BOILERS EXPLODE.

The records kept by the Hartford Steam Boiler Inspection and Insurance Company show that 170 steam boilers exploded in the United States last year, killing 259 persons and wounding 555. The greatest number of explosions in any month was 25, in December. The number for January is 19, September and November, 16 each; the other months ranged from 10 to 14, the lowest number being in June.

The classified list shows the largest number of explosions in any class to have been 47, in sawing, planing, and woodworking mills. The other principal classes were in order: Paper, flouring, pulp and grist mills, and elevators, 19; railroad locomotives and fire engines, 18; steamboats, tugboats, yachts, steam barges, dredges, and dry docks, 15; portable engines, hoisters, thrashers, pile-drivers, and cotton gins, 13; iron works, rolling mills, furnaces, foundries, machine and boiler shops, 13; distilleries, breweries, malt and sugar houses, soap, and chemical works, 10.

It would be an interesting thing to have a statement of relative frequency of explosion—the number, that is, to each thousand boilers in use in each given class of steam-using establishments.

STORM WARNINGS IN COURT.

On the night of March 24, 1877, the hull of the steamboat Rockaway, built at Norfolk, Va., was taken by the steamship Wyanoke, of the Old Dominion Line, to be towed to this city. As the vessels passed Fortress Monroe the attention of the captain of the Wyanoke was called to the Government Storm Signals, but they were disregarded by him. Subsequently the storm became violent, and the Rockaway was wrecked.

The owner of the Rockaway brought suit against the Old Dominion Steamship Company to recover damages to the amount of $40,000. The main plea of the plaintiff was that the captain of the Wyanoke, in disregarding the storm signals, failed to exercise due diligence and precaution for the protection of the property in his care. The case was recently decided, the jury returning a verdict for the plaintiff, giving him $35,018.37, with five per cent. allowance.

AIR AND WATER.

The two substances everywhere met with on the surface of this globe which receive the least popular attention are air and water. The latter especially is one of the most remarkable substances in nature, and exceeds in its pervasiveness even the air. Go where we will, on the most arid desert, the mountain top, the frozen pole, in the deepest cavern, we meet with water in some or all of its forms. The coldest, hottest, or driest air found in nature contains aqueous vapor. Water forms a large portion of many minerals, in which by the giant power of chemical affinity it is directly combined or is locked up as water of crystallization. To adequately discuss all the natural phenomena in which some form of water is a factor, would require a volume; to enumerate and describe all its industrial applications would require a number of volumes.

Both air and water are essential to the existence of all known life. Our bodily health can only be supported by our taking quantities of both at short intervals. Both may and often do become the vehicles of deadly poisons, which in densely populated countries and towns are liable to contaminate them. It is of essential importance that supplies of each needed for the support of animal life should be pure.

Air and water are the great natural distributers of heat and cold. The climates of different parts of the world are very materially affected by the hot or cold currents of air which flow over them, and by the analogous currents of water established by the action of heat in the great seas. Proximity to large bodies of water also has a very important effect upon climate. Water slowly absorbs the summer heat in very large quantity, and slowly gives it off again to the colder air of winter, thus tempering what would otherwise be cold and freezing winds, and retarding frost.

Air and water are the great natural distributers of mechanical energy. The currents of rivers represent a portion of the mechanical equivalent of solar heat expended in raising the masses of water that flow through their channels to the clouds. The winds that propel our ships and wind motors are the product of solar energy also. The chief and most economical means by which the heat generated in the combustion of fuel can be converted into mechanical energy for the propulsion of machinery is water, which this heat converts into steam.

The envelope of aqueous vapor which surrounds the globe, and forms a notable part of its atmosphere, is, as has been well shown by Tyndall, the great conservator of terrestrial heat. Should this aqueous envelope be removed by any cause the heat of the earth's surface would so rapidly radiate into space that every living thing would shortly perish.

The ice cover which forms upon the surfaces of lakes and rivers protects the life which exists in such waters. Were it not for this provision of nature these water deposits would become solid masses, in which all their teeming life would be immovably imprisoned.

The snow blankets which have spread this year over a large portion of our land perform a similar service for the vegetable life which lies dormant below. Without this protection the ground would be too deeply frozen, the frost would be too late in leaving the earth in the spring, the growing season would be shortened, and many of the plants that now thrive in the temperate zones would cease to exist in latitudes where they now abound.

Air and water vapor are the great diffusers of light. Were it not for our atmosphere no solar light could penetrate our houses where the sun's rays do not directly enter, except such as might be reflected from solid objects. Everything not directly illuminated by the sun would lie in deep shadow. In the mid-day many of our apartments would require artificial illumination. Out of the direct sunshine only the lowest forms of life could exist. But the enormous diffusing, transmitting, and reflecting power of our atmosphere compensates almost wholly for disadvantages of position, causing light to penetrate almost as universally as the air itself.

Thus is illustrated the wonderful character of these common substances—air and water—so important to all animated existence, yet so heedlessly regarded by the mass of mankind.

THE INDUSTRIAL CONDITION OF CANADA.

A couple of years ago our Canadian neighbors, tired of industrial stagnation, adopted a protective tariff in the hope of developing home industries. A return to a free trade policy is strenuously insisted upon by many Canadians, whose idea of national economy never rises above the sophistry of "buying in the cheapest market."

In an argument for the policy now under trial the *Industrial World* of Montreal describes a very hopeful state of things as its first fruits, and points out the obvious conditions of the new prosperity:

"Suppose, for instance, a factory is opened in Montreal, giving employment to 1,000 hands. what does this mean? One thousand factory employes will represent a population of at least 2,500. What would the closing of this factory and consequent expatriation of these craftsmen mean? A loss of 1,000 to 2,500? Much more. These artisans require boot, shoes, hats, caps, meat, bread, roots, vegetables, medi-

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cine, clothing, houses, wood, etc., almost *ad infinitum*, and likewise each of the new or additional industries which they inaugurate or add to in all its various forms, require the same things. So that each thousand artisans probably adds, in one way or other, 5,000 additional to the population. Have our free trade friends ever considered this? What emptied one-fifth of the houses of Montreal under the late regime? The closing of the factories. What stunted the growth of the city during that dark era? The impediments which the tariff raised to the establishment of new industries and the development of diversified labor. All the artisans employed in the factories of the metropolis wanted homes. It required carpenters, joiners, bricklayers, painters, plasterers, roofers, glaziers, workingmen of all kinds to erect these houses. It required vast quantities of agricultural produce to fill the stomachs of the various craftsmen which the tariff furnished with a purchasing power. And although to-day the same clouds float over us, the same sun, moon, and stars light the heavens by day and night, in the language of Webster, How altered! and how changed! Of 2,000 notes falling due on the 3d of February in the Bank of Montreal, not one was protested ! ! Among the thousands of vacant houses in Montreal in '78, not an empty place is to be found, and the demand is for hundreds more. The market is flooded with money for investment. Canada fours are worth more than Canada sixes were formerly. Our alms houses, except for the old and infirm, are empty, and the soup kitchen is now a matter of history. The railways are unable to carry the freight offered to them, and the demand for increased accommodation is met by the employment of thousands of able hands, working night and day to meet the public wants! Never was there an era promising greater prosperity for Canada. Bank stocks have appreciated 37½ per cent, and all securities have become correspondingly improved in value, and the prospect of a £1,000,000 surplus for the financial year ending July 1, stares us in the face to terrify us into a free trade policy! If it is a bad policy to swap horses while crossing the stream, we think it would be rather imprudent to risk a change from prosperity, under protection, to one of promised increased (?) aggrandizement under free trade."

ARTIFICIAL DAYLIGHT.

The lighting of large interiors from without—that is, by surrounding the space to be illuminated with powerful lamps, so placed as to fill the air with diffused light—is certainly a bold, though not entirely a novel, proposition; yet, either to attract attention or to establish an important economic principle, the Northern Electric Light Company is begging Congress to allow them to light in that way the Capitol at Washington. At first they asked Congress to appropriate money enough to defray the actual cost of illuminating the Capitol and the grounds about it to the brilliancy of broad day, thus making interior lamps unnecessary. But no disposition being shown by Congress to encourage the experiment, the friends of the project subsequently offered to assume the risk of failure, and to furnish the means for making such a crucial test of "artificial daylight," on condition that the government would agree to accept the innovation in case it succeeded, and the saving in the cost of lighting the Capitol should prove in three years equal to the cost of the system. This proposition appears to have met with no greater favor than the first, whether from suspicion as to its purpose or feasibility, or because the expiring Congress had larger and more pressing interests to consider, does not appear.

The plan proposed contemplated a crown of electric lamps, 150 in number, surrounding the dome of the Capitol, and so arranged as to shine into the skylights in the roofs of the wings of the building.

In addition, at various points about the Capitol grounds, it was proposed to erect six iron towers, to be surmounted by circular conical lanterns, 11 feet in diameter, and from 125 to 200 feet above the ground, or 50 feet higher than the roofs of the wings of the Capitol. Each lantern was to contain 50 electric lamps. The 450 lamps upon the dome and in the tower lanterns were designed to be about 6,000 candle power each, aggregating something like forty times the light power now employed in and about the Capitol, or about that of 200,000 average gasburners. This light, it is estimated, would not only illuminate the interior of the building as well as daylight, but would furnish a surplus sufficient to remove the need of street lamps anywhere in the city.

To generate the electric current there would have to be supplied not less than three dozen large dynamo-electric machines, capable of absorbing the power of four steam engines of 300 horse power each. The cost of the system was estimated at $350,000, distributed as follows:

Four hundred and fifty 6,000 candle power electric lamps, at $80,	$36,000
Thirty-six large dynamo-electric machines, at $3,600	129,600
Four 300 horse power steam engines, twelve boilers, and the requisite fixtures and shafting	40.000
Houses for boilers and machinery	25,000
Six iron towers—two 200 feet high, two 150 feet high, two 125 feet high, including lanterns, reflectors, elevators, and foundations	80,000
Setting up machinery and apparatus, including cost of subterranean wires	15,000
Land	15,000
Engineering and contingencies	9,400
Total	$350,000

The estimated running expenses of the system, including repairs, is $60,000 a year—the present means of illuminating the Capitol costing annually upwards of $110,000, the city paying $60,000 more for street lamps. The aggregate illumination promised by the new system is twenty times that of all the outdoor lamps in Washington and all the lamps in the Capitol building combined: or a light equivalent to bright moonlight throughout the city, and diffused daylight in and about the Capitol.

Perhaps the incoming Congress will have time to investigate the project, which is, at all events, a "brilliant" one.

New Instrument for Sea Sounding.

Mr. Lucas, engineer to the Telegraph Construction and Maintenance Company, London, has invented an instrument for sea sounding which he styles a "nipper-lead." The old plan of ascertaining the nature of the sea bottom, by bringing up a specimen of it in a tube, let into the bottom of the sinker and armed with tallow, is open to several objections. For instance, the specimen is apt to get washed out in rising to the surface, and when it is safely brought on board it is usually so smeared with tallow as to be objectionable. The nipper-lead of Mr. Lucas, on the other hand, retains what it catches and renders it up in a pure state well fitted for preservation. The bottom of the lead or sinker in question is provided with two hollow claws or spoons, not unlike the mandibles of a crab. These are hinged to the sinker, and open out against the resistance of a stout spiral spring which is contained in the body of the sinker. When fully opened out they are kept apart by a locking device, consisting of two crossbars which meet end to end and fit into each other The points of the open claws, however, in striking upon the bottom, spring this lock, and the claws snap together with great force, nipping up a specimen of the bottom at the same time, and from their hollow shape this specimen is retained. So effective is the nipper-lead that the claws will nip a sheet of paper off a table, and they have been found to raise a specimen of the bottom from 2,000 fathoms.

A Rich Man's Work Room.

The owner of the great Cornwall iron estate in Pennsylvania, Mr. Robert Coleman, has a fine mechanical taste and pays much attention to mechanics and engineering. To facilitate his investigations he has constructed a circular railroad with a double line of steel tracks, inclosed in a large building. The length of the track is about 150 feet, with two sidings. Patent safety switches, electric crossing signals, safety frogs, and the latest methods of fastening rails are employed. The turntables of the miniature round house operate automatically. The three small locomotives comprise every piece of mechanism, every rod, bolt, screw, lever, spring, tire, cock, pipe, and pump of the largest machines. The boiler-jackets, rods, and drivers are nickel-plated, and some of the bright work is silver-plated. The cabs are of solid walnut, and the boilers proper and the fireboxes are of wrought steel. The tenders are of copper, and their water supply is taken by scoops from vats on the roadway while the locomotives are in motion.

The locomotives are about four feet in length, including the tender, and are models of beauty. They are of English design, so far as high driving wheels are concerned, otherwise they are advanced American mechanical ideas and have many original appliances of Mr. Coleman's invention.

The locomotives are fired up and set in motion. Around the tracks they go, while the millionaire owner watches the movements of the miniature machinery. Hours are thus passed, all sorts of experiments are tried, high speed and low speed are compared to determine the comparative effects of friction, and other questions of railway economy.

A Remarkable Fish.

There was lately on exhibition in Boston a fish caught about twelve miles from the Isles of Shoals by Wallace Wright, of the fishing schooner Jennie P. Phillips, from Swampscott. At the time of its capture it was 15 feet long and weighed 2,430 pounds. In its stomach were found a codfish weighing 50 pounds, two smaller cods, and two coots. It had a large mouth, containing seven rows of sharp teeth, and in general appearance was somewhat like a shark, but what is most singular is the fact of its being uncommonly well supplied with respiratory organs. It had not only a mouth, but gills, nostrils, and blow holes. While on exhibition at Lynn the fish was examined by several scientific gentlemen, but no one has been able to classify it.

Improved Lace Machine.

A machine for making laces hitherto produced only by hand work is reported in France. Even old styles of laces, the art of making which has been lost, can readily be reproduced. The machine employs from 1,800 to 2,000 spindles, and from 200 to 300 pins. The *Moniteur des Fils et Tissu* speaks in high terms of the machine and its products, which are said to be fully equal to the best hand-made laces.

A Big Cow.

Posey County, Indiana, claims to have raised the largest cow in the world. Her name is Lady Posey; breed, mixed Durham and Big English. Her measurements are: Greatest height, 5 feet 10 inches; girth, 8 feet 9 inches; length, 10 feet 6 inches, or including tail, 17 feet. Her form is good; and, though not fat, she weighs 3,000 pounds. Her color is red and white, red predominating. Age, six years. Her present owner lives in Stark County, Illinois.

SANITARY ARRANGEMENTS IN HOUSES.

The Society of Arts, London, have just announced that they will award three medals for plans showing the best sanitary arrangements in houses built in the metropolis, such plans to be exhibited in the society's rooms, Adelphi, in June, 1881, and to be sent in on or before May 12, 1881: The conditions of the competition are as follows:

1. One silver medal will be awarded for the best sanitary arrangements carried out and in satisfactory working in a house let out in tenements to artisans for which a weekly rental is paid.

2. One silver medal for the best sanitary arrangements in actual satisfactory working in a house of the yearly rental of from £40 or less, to about £100 in value.

3. One silver medal for the best sanitary arrangements in actual satisfactory working in a house of the yearly rental value of £200 and upward to any amount.

4. The houses must be open to the inspection of judges, who, in considering their award, will be guided by the suggestions of plans for main sewerage, drainage, and water supply, made under the Public Health Act, 1875. The houses must have been in actual occupation within the last three months, and a certificate must be given by the occupiers, on a printed form, stating the satisfactory working of all the sanitary arrangements, such form to be obtained at the Society of Arts.

5. The houses may be old, fitted with modern sanitary arrangements, or may be new. They must be within the metropolitan area of the Board of Works.

6. The sanitary arrangements must include the conditions for good water supply, drainage, warming, and ventilation of the house, and precautions taken against frost.

7. The medals may be awarded to the occupiers of the houses, or the lessees, or the owners.

8. The plans must consist of a ground plan and sections, to the scale of not less than 1 inch to 5 feet; details not less than 1 inch to the foot. The plans may be accompanied by specifications.

9. The names of the architects, surveyors, or sanitary engineers who directed the sanitary arrangements should be given, and certificates will be awarded to those whose plans obtain the medals

French Electrical Exhibition.

The works for the Paris Exhibition of Electricity will soon begin. A viaduct is to be built for the English electrical railway by Siemens, which will convey visitors from the Place de la Concorde to the Palais de l'Industrie. The internal arrangements will only be made at the end of the Art Exhibition, which takes place from May to July. The French exhibitors of the electric light have come to an agreement in order to combine for the illumination of the nave and other parts. They are trying to obtain from the city an indemnity for their working expenses.

Simple Fire Escape.

The netting which trapeze performers use to break their fall, in case of accident, the *Fireman's Journal* suggests, might furnish a valuable hint to Fire Department officials. Such a net could easily be carried in a small compass attached to the hook and ladder truck, and could be readily and securely fastened by ropes to lamp posts, telegraph poles, awning posts or the like, in front of the burning house, or in case of need be upheld by dozens of sturdy and willing arms. It would, no doubt, help to save many lives of persons compelled to jump from upper windows. Such a device has been tried in Germany with good results.

Marking Salmon.

The Fish Commissioners of Maine have adopted the plan of marking salmon to obtain data with regard to the development and migrations of these fish. Several hundred salmon lately set free in the Penobscot River have been labeled with light metal tags, the number on each being recorded. The Commissioners ask that whoever catches a labeled salmon in any waters of the State will forward to them the fish, for which they will pay an extra price, or else forward the label and whatever they know about the fish that wore it.

Rectifying Alcohol.

If a quantity of 40 to 50 per cent alcohol is placed into a retort and a vacuum is created in this retort by means of an air pump, and the retort is placed into or in connection with the cooler of an ice machine, the alcohol will be evaporated. As the evaporation of the alcohol causes the temperature of the retort to drop below the surrounding temperature, the warmth of water at an ordinary temperature will be sufficient to evaporate the alcohol, and the same can be rectified without the use of fuel.—*R. Pictet, in Revue Univ. de la Brass et Dist.*

BLEACHING ALBUMEN BY MEANS OF ELECTRIC LIGHT.—The albumen, from which the blood corpuscles have been entirely removed, is subjected to the action of an electric light, the rays of which are properly collected by means of lenses, etc., and will be bleached within twenty-four hours. The albumen may be in a dry or fluid state.—*L. Manet (Monit. prod. Chim.).*

AN examination has taken place at Brussels of the railway employés, in order to test their eyes. More than one-twentieth of them have been found defective, and consequently will be discharged as being unable to fulfill their functions with a sufficient security for travelers.

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BARREL MACHINERY.

[*Continued from first page.*]

and small casks such as are used for lead and other paints, butter, powder, nails, and other similar commodities. The truss hoops are driven by screw power, and the machine does its work rapidly and thoroughly, and when used in conjunction with the other machines which are intended to be used as a part of the plant in the manufacture of kegs, completes a system of machinery that will perform most of the cooper's work on this class of packages.

A machine for turning the heads of kegs is shown in Fig. 3. This machine is capable of making all kinds and sizes of heads, is very rapid in its operation, is readily changed from one size to another, and will work well on any kind of wood.

Fig. 5 shows a machine for leveling and trussing slack barrels. As the production of flour, sugar, cement, salt, and vegetables is very large, and as the greater part of these commodities are put in barrels, it is a matter of great importance to have the barrels made not only as cheap as possible, but strong and capable of bearing rough usage. The machine for leveling and afterward trussing such barrels, and the machines furnished with it for completing the plant, will level and then drive all the truss hoops upon 6,000 barrels per day, and the machines that make up the plant are equal to it in capacity and usefulness; they are as follows: barrel setting up forms, power windlass, and the chamfering and crozing machine. The last named machines will do their portion of the work at the rate of 3,000 barrels per day, and it requires two of each to be equal to keep pace with the trussing machine in making 6,000 per day.

Messrs. E. & B. Holmes manufacture a large number of machines for making kegs, barrels, and casks, which are described in their illustrated catalogue.

Further information respecting this class of machinery may be obtained by addressing E. & B. Holmes, Buffalo, N. Y.

The Glycerine Barometer.

Mr. James B. Jordan, of London, in the course of his experiments on various fluids for the barometer was led to try glycerine, which appears well adapted for the purpose. Its vapor has a very low tension at ordinary temperatures, and as its freezing point is much below zero, it is so far excellently adapted for use in barometers. The mean coefficient of expansion by heat is, according to Professor Reinold, 0·000303 for a degree of Fahrenheit's scale, and a table has been computed on this basis for reducing the observations to 32° Fah. Glycerine possessing the capability of absorbing moisture from the atmosphere, its surface in the cistern is covered by a layer of mineral oil, which has no effect whatever on the glycerine, and which does not evaporate at ordinary temperatures. At sea level the pressure of the atmosphere supports a column of glycerine of a mean height of 27 feet, and accordingly the tube of the barometer is made some 29 feet in length. It is formed of composition gas pipe, five eighths of an inch in diameter, but the upper part, 4 ft. or so in length, is of glass tube, having an internal diameter of 1 inch. The top end, instead of being sealed, is spread out into a cup shape, having a small orifice plugged with a stopper of rubber. The cistern is of tinned copper, 4 inches deep and 10 inches in diameter, and the air is allowed to press on the surface through a small hole leading into a chamber containing a filter of cotton wool. At the bottom of the cistern is a closed channel opening into the center, and to this is attached a projecting vertical tube, to which the main tube is soldered. The object of this channel is apparently to provide a means of closing the tube by a screw plug when refilling is necessary. The quantity of glycerine required for such an instrument is about a gallon, and this being warmed in a water bath and tinted with rosaniline, sufficient is poured into the cistern to cover the orifice of the channel. The plug at the top end is then removed, and the tube completely filled by pouring the glycerine gently down on one side. After allowing it to rest for some time, the air bubbles will be found collected at the top, when the tube is again filled up to the cup, and the stopper replaced. The screw plug in the cistern being removed, the column will fall until balanced by the pressure of the atmosphere, and the vacuum is as perfect as it is possible to get it, the small quantity of glycerine remaining in the cup above the stopper, hermetically sealing it. The glycerine barometer is, therefore, a simple and easily-managed instrument; but it is not pretended that it can take the place of the standard mercurial instrument for precision. It is comparatively a new instrument, and its value as a piece of scientific apparatus has yet to be shown.

MISCELLANEOUS INVENTIONS.

Mr. Hiram B. Gray, of Columbus, Texas, has patented an umbrella and sunshade which can be attached to the person, leaving both hands free for driving or other purposes.

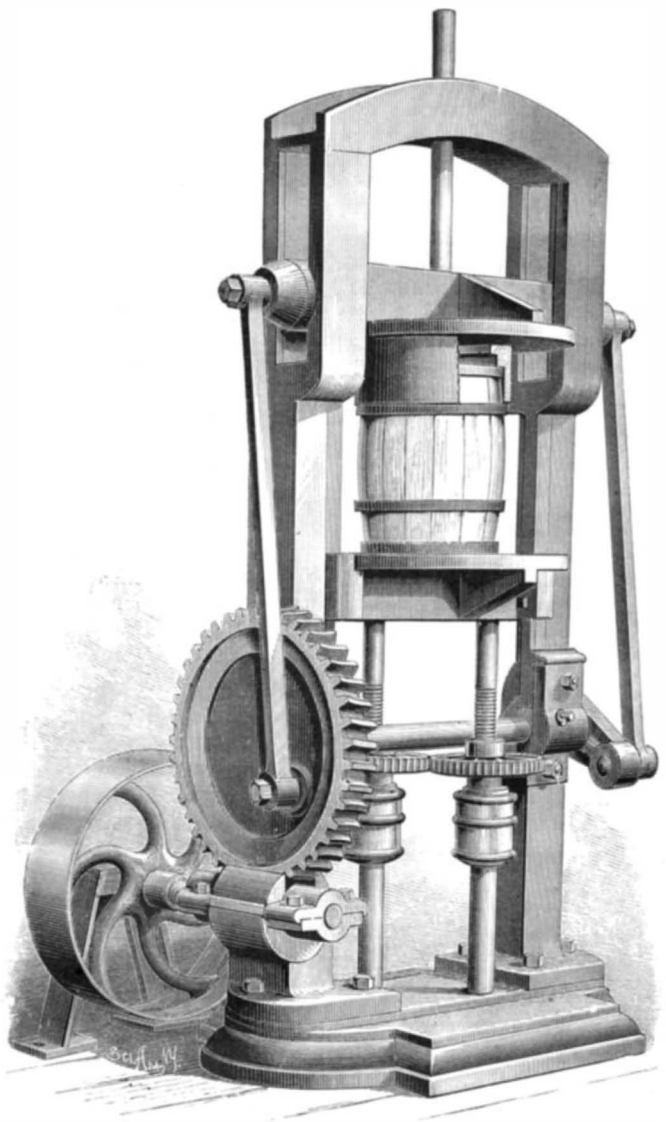

Fig. 4.—MACHINE FOR LEVELING KEGS AND SMALL CASKS.

Mr. George W. Brumm, of Boise City, Idaho Territory, has patented a book protector, which consists of a case for containing a book and securing it from injury, the case being provided with means for fastening it to desk, pew, table, etc. This invention will be found useful in churches, public libraries, schools, etc.

Mr. Alphonse J. Delavigne, of New Orleans, La., has patented a turn-table in which a novel arrangement of parts causes the table to turn in one direction by the action of the weight of the car, and in an opposite direction through the action of a spring.

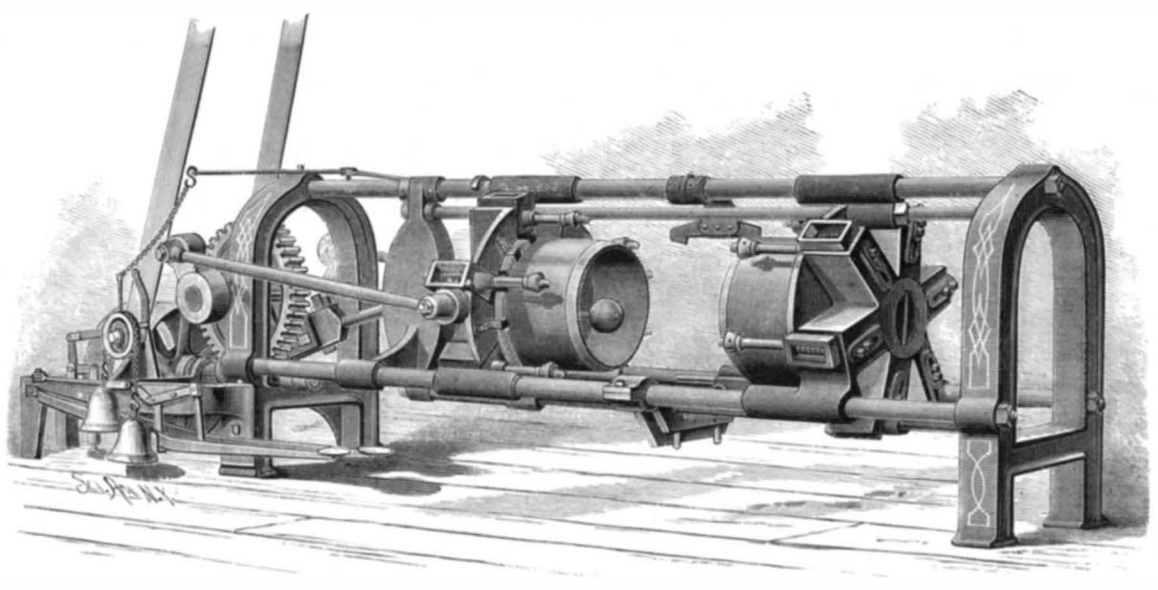

Fig. 5.—MACHINE FOR LEVELING AND TRUSSING SLACK BARRELS.

Mr. David S. Thomas, of North Platte, Nebraska, has patented a windmill which supplies an improved device for controlling or adjusting the sails or vanes. A clutch wheel or spider and a spirally grooved loose sleeve, to which is attached a small vane, are fixed on the axle of the wheel. The sleeve engages with a stud, and when turned in one direction draws the wind wheel into clutch with the spider, whereby the vanes are set to the wind The vane on the loose sleeve also acts to adjust or throw the vanes flat in a high wind.

Mr. John M. Hastings, of Oskaloosa, Kansas, has patented a windmill water elevator, so constructed that it will automatically stop or start to keep the receiving trough always supplied with water. A valved bucket suspended on the end of a trip-rod which is connected with the wind-wheel, constitutes the simple mechanism by which object is effected.

Mr. Frederick W. Claussen, of New York city, has patented an improved drying-room clip for use in laundries, etc. It has the advantages of spring-clips without the disadvantages of the ordinary spring clip. Instead of supporting the articles by the spring itself as heretofore, he suspends them on a rigid hook provided with a retaining spring.

Mr. Pierce B. Anderson, of Brownsville, Tenn., has patented a corn and pea planter, of the kind known as walking planters, which are rolled along on wheels by a person walking. He has supplied novel lever mechanism for operating the seed slide, by which the machine can alternately drop different kinds of seeds, as, say, corn and pease, so that the rows may be planted in the two kinds of seeds alternately deposited.

Mr. Franklin McLellan, of White River, Washington Territory, has patented a potato digger, the invention consisting of a forked and concave plow, an arched standard having holes in its arms, a pin or bolt, a shaft having arms, a lever and catch, a pawl having a handle, and a separator having gudgeons and wheels, whereby, as the machine is drawn forward, the wheels run upon opposite sides of the row to be dug, and the plow passes beneath the hills and raises them with the potatoes embedded in them and delivers the soil and potatoes to the separator, which separates the potatoes from the soil, the soil falling through between the bars and the potatoes falling from the rear end of the separator upon the top of the soil.

Messrs. William Mainzer and John Singer, of New York city, have patented a cask for beer and other liquids so constructed that it can be safely handled and transported without detaching the faucets, and can thus be furnished to the consumer with faucets applied ready for use, and can be returned to be refilled without detaching the faucets. The cask is constructed with two heads at one end, the outer one provided with a hinged door, a folding faucet being inserted in the inner head, and reached for operating it through the hinged door in the outer head.

Messrs. John W. Holdsworth and James C. Pringle, of St. Louis, Mo., have patented an illuminated sign which provides means for giving different colors to the letters and for changing the colors. Movable transparent colored strips are arranged behind the letters and moved by suitable mechanism to effect the result.

Mr. Emil Puchta, of Washington, Mo., has patented an improved table of the class known as "saloon tables," provided with boxes underneath them for holding cards, beer-mugs, etc. The boxes are in this invention arranged at the corners under the top, and immediate arches, which serve to brace the table and allow a space for the legs of the sitter, are arranged between the boxes.

Mr. Burnett B. Harris, of South Bend, Ind., has patented an improvement in casting bolt-holes in chilled mould-boards, by which in casting such holes with metal dies the contraction of the casting in cooling is prevented from either cracking the mould-boards or breaking off the points of the dies.

Mr. Volney W. Mason, of Providence, R. I., has patented a reversing mechanism for elevators, which consists of a pair of beveled friction wheels attached to the driving shaft, the beveled friction wheel having a rim and being attached to the shaft, with which is connected the machinery to be reversed, the pulleys carrying the reversing cord, the eccentric sleeve for shifting the movable friction wheel, the stationary brake, and the stop-pin.

Mr. Chester C. Clark, of Brownwood, Texas, has patented a folding cradle which is formed of two triangular folding end frames provided with folding braces and connected by longitudinal rods, from which a canvas bottom is supported, which frames are pivoted at their apex on the top of two connected triangular folding standards, and are provided with a crank for swinging the cradle. A bent rod from which a fan is suspended is attached to the bearings of the cradle in such manner that the fan moves in an opposite direction to that of the motion of the cradle. The fan may be operated independently

Mr. John H. Sutfin, of Las Vegas, Territory of New Mexico, has patented an improved coupling for earth augers and rock drills, so constructed that the bits can be easily and quickly attached to or detached from the shafts, and thus save much time ordinarily lost in such attachment and detachment.

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Fruit Flavorings.

I give instructions by which all confectioners may extract and preserve their own fruit essences, and so guard the health and add to the pleasure of all for whom they provide. Among the juicy fruits are strawberries, raspberries, blackberries, cherries, and currants; among non-juicy fruits are the apple, pears, peaches, quinces, apricots, and plums.

Mash the juicy fruits in a basin to a pulp. Place on the fire and make scalding hot. Now pour into a hair sieve and allow the juice to strain through. Put into bottles and securely tie down. Place these bottles in a caldron of cold water and boil for twenty minutes. Remove from the fire and allow to remain in the caldron until cold. Then set away for use.

In the case of non-juicy fruits, such as apples, pears, peaches, etc., put the fruit into a basin. Cover with water and boil to a pulp. Now place on a hair sieve and allow to drain without any pressing. Observe now that it is only the liquor which passes through the sieve without pressing which is to be used for flavoring purposes. What remains in the form of pulp is not adapted for these uses. Now put the juice obtained as above into bottles, and proceed to treat as already laid down for the juicy fruits.

The foregoing processes are to be gone through with in the case where the extracts are to be kept transparent and clear, as for sirups, cordials, and beverages.

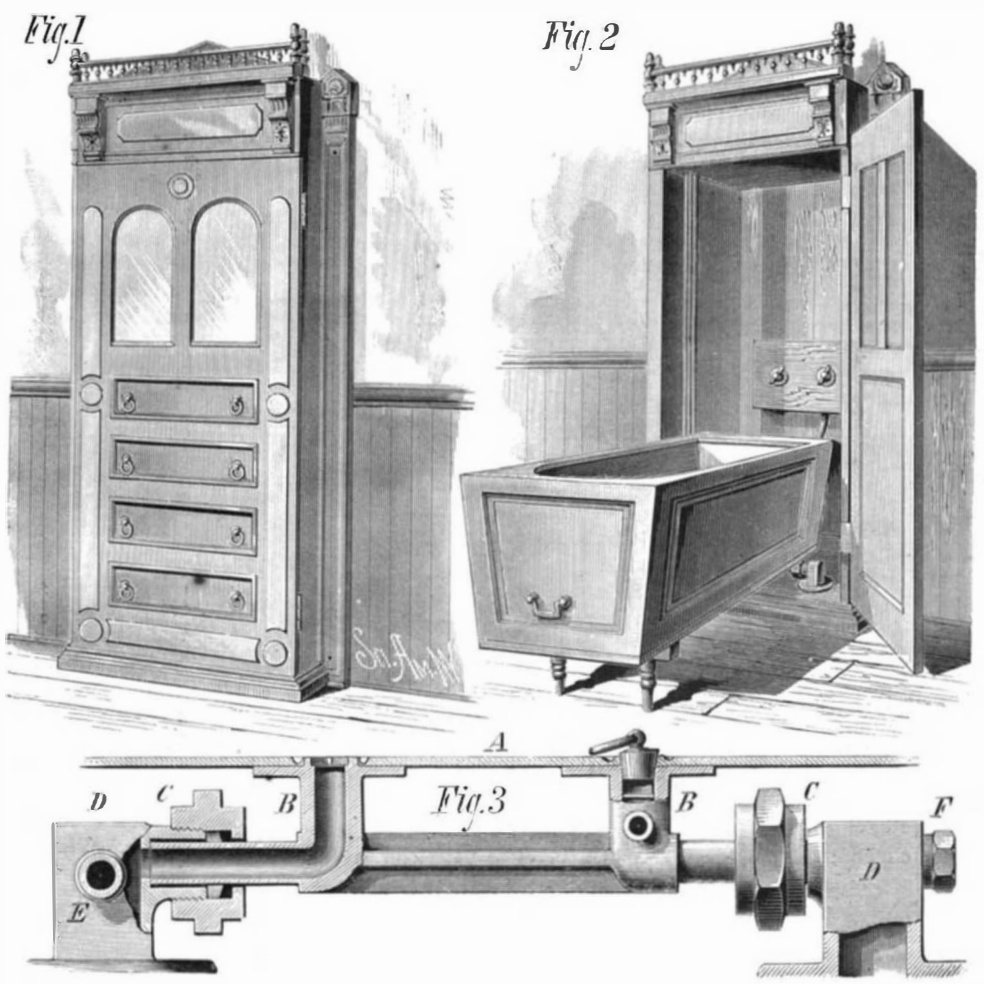
In case where the flavorings are to be used for any purpose where transparency or clearness is not desirable, such as for ice creams, fruit ices, or bonbons, then I would use not only the clear fluid, but the pulp of the fruit also. I would for these opaque purposes save and utilize everything of the fruit except the skins and seeds. This pulp to be treated as already laid down.

As thus obtained and preserved our confectioners can supply themselves with a quantity of perfectly pure extracts of all their favorite fruits, and which can always be at hand, for flavoring every description of pastry, cakes, pies, tarts, puddings, creams, ices, and beverages, and at any season of the year. Especially when there is any one in the house who is sick or feverish, cordials may be flavored with these delightful sub-acids—these remedies and restoratives of kind mother Nature herself—such as will shoot through all the veins of the most debilitated and infirm the most delicious sensations of happiness and hope.—*James W. Parkinson, in Confectioners' Journal.*

NEW FOLDING BATH TUB.

We give an engraving of a very convenient folding bath tub lately patented by Mr. George Damen, of 88 Luqueer street, Brooklyn, N.Y. When closed, as in Fig. 1, this device has the appearance of a chiffonier or bookcase, and forms an ornamental piece of furniture; and when opened for use, as in Fig. 2, it is in every way as convenient as the ordinary stationary bath tub. This construction admits of placing a bath tub in every sleeping room without occupying space valuable for other purposes. The arrangement of pipes by which the water is introduced and removed from the tubs, is shown in Fig. 3.

To the bottom of the tub, A, are attached flanges of the elbows, B, whose horizontal arms extend through stuffing boxes, C, on the hollow supports, D, and form the pivots on which the tub turns. One of the hollow supports, D, has two nipples, E, one on each side, one for cold water and the other for warm water, the two water pipes being provided with stop valves, seen in the back of the case. The outlet is provided with the usual plug and strainer, and a pipe, F, leads to the water or sewer pipe. The overflow at the foot of the tub is connected with the outlet pipe in the usual way. The bath tub has a pair of legs hinged under the head, so that they fold automatically when the tub is raised up. To economize room the wall is recessed to receive the tub when folded up, and, if desired, the tub may be placed in a small wall closet, where it will be concealed by an ordinary closet door. In some cases the inventor attaches to the closet, walls, or door a series of folding doors or screens which may be unfolded to form a temporary bath room. One of the great advantages of this invention is that it permits of taking a bath in a room that is comfortably warmed and obviates the necessity of warming the bath room.



DAMEN'S FOLDING BATH TUB.

INSTINCT OF BEES.—Here is something new, and whether it exists in fact or not, it forcibly exhibits what most people call the "instinct" of bees. In a hot dry valley in New South Wales, the bees suffered last year from a long-continued drought. This year, says a contemporary of that colony, the wonderful little fellows have made provision against another like trouble, by filling a large number of external cells in each hive with pure water instead of honey.

IMPROVED ROPE-CLAMP.

The engraving shows an improved clamp for fastening ropes and cordage, recently patented by Mr. James C. Covert, of West Troy, N. Y. It consists of a short thimble having a boss on one side, which is threaded internally to receive the pointed clamping screw. There is an opening in the thimble opposite the boss to admit the end of the screw. The clamp is applied to the rope as indicated in the engraving, the thimble being slipped over the rope, the screw passing transversely through the body of the rope between its strands.

ROPE-CLAMP.

Another New Composition.

The discoverer of celluloid is reported to have composed a new composition for buttons, boot heels, and other like purposes. A foreign contemporary gives the following as the ingredients and the process of manufacture: Leather cuttings are soaked in hot water to remove the oil, and then dried and ground to powder. The powder is afterward subjected to high pressure in suitable moulds, at a temperature of 240° to 250° Fah. This produces surface hardening, leaving the interior of the casting in an elastic state. If the powder is mixed with any other ingredient, a temperature of 290° to 310° Fah. should be employed, so as to secure partial fusion of the leather.

Disinfection with Sulphurous Acid.

At the instance of the Swiss Federal Department of Commerce and Agriculture, Dr. Fatio lately made a number of experiments at Geneva, primarily with reference to the prevention of the spread of phylloxera. He has shown that it is always possible to disinfect vehicles and objects suspected of carrying dangerous germs by means of anhydrous sulphurous acid, either by injecting it in the gaseous state into vehicles that are closed, or by pulverizing the liquid against surfaces directly exposed to the open air. Various degrees of moisture in the surrounding atmosphere require considerably different doses of the acid in the poisonous mixture. With regard to disinfecting plants, he finds they resist the deleterious action of the poison better when they are treated at a stage distinct from that of vegetation; also the more aged, dry, and completely ligneous they are. The various collections of natural history (dry preparations) may be quickly, easily, and without danger freed of their parasites by simply pulverizing anhydrous sulphurous acid in their receivers, in quantity proportioned to the size, and less the more nearly hermetical the closure. Dr. Fatio further considers the method is applicable to removing parasites from furniture or tissues. He advises, *e. g.*, injection of the acid through a small hole and with a siphon into rooms infested with bugs (about 50 cubic centimeters of liquid per cubic meter of air), the rooms to be first well closed and isolated, and not to be occupied or slept in for some hours after the operation.

Oakland Harbor.

Work for the improvement of the harbor at Oakland, in San Francisco bay, is being carried on. Some idea of the extent of this great engineering enterprise may be better realized when we state that the two jetties, which are nearly parallel, extend from the shore line out into San Francisco bay a distance of 12,076 feet. This is 1,000 feet longer than the jetties built by Capt. Eads, at the mouth of the Mississippi river, about which the public has heard so much.

The stone contract now under way at Oakland contemplates raising both existing walls up to high water level, by building a heavy dry-stone coping on its old walls as a foundation. The stones on this coping are being carefully placed in position, the stones weighing frequently from one to two tons each, the spaces between these large stones being carefully filled in with smaller size by hand, so as to make a good compact wall.

Where most exposed to the sea the crest is made eight feet wide and with a slope of two to one, composed of stone carefully laid down to a point two feet below low water.

The total amount of stone required to finish this present contract is estimated to be between 60,000 and 75,000 tons, the price per ton delivered and placed in proper position being $1 and $1.19, depending upon size.

The stone now being added to the walls is taken from McNear's quarry at Pedro Point, opposite the Sisters' lighthouse, at the entrance to San Pablo bay, whence it is brought in large light draught barges, towed by a tug, and delivered at the site of the jetties at the rate of 8,000 tons per month. These barges are drawn up parallel with the walls at high water, and the rock is thrown on to the wall or wheeled down in position, according to the work being done. The men who are doing the contractors' work live in a floating barge, which is moored near by the scene of their labors. Work has gone on pretty rapidly this winter, as we have had smooth water so much of the time, few gales having occurred.

The object of raising the walls up to high water is to confine the ebbing tide from the inner harbor more effectually than has been heretofore done by the low walls built during previous contracts, and which have permitted the best half of the tidal water to escape laterally over their tops. This has, of course, lessened the scouring action of the ebbing waters, as they were not properly confined in the channel between the walls. On the very high tides a vast mass of water sweeps laterally across the jetties, and it is not until the tide has half fallen that the water can do what scouring is necessary to keep the channel clear. This lateral sweep of the water is dangerous for sailing craft during light winds, since, instead of the tide taking them to the mouth of the harbor, it is apt to sweep them on to the north wall with the ebb and south wall with the flood tide.

The walls, as they have been for a few years past, might have been considered obstructions rather than aids to navigation. Being out of sight except at half tide, schooner men had to be very careful not to run on to them.

In addition to the stonework now going on, it is contemplated shortly to dredge out and widen the present deep water channel between the jetties, so as to offer better facilities for navigation. The channel dredged out is now so narrow that steamers passing are crowded, and sailing vessels are apt to get ashore. It is confidently expected that the effect of raising the jetties to high water level will be to maintain such a channel free from sandy deposit, no matter whether it comes from the inner harbor or from the wave action of San Francisco bay.

The work on this harbor has been going on under the direction of Lieut.-Col. G. H. Mendell, U. S. Engineer, ever since its commencement in 1874, and the results have been very successful in developing the commercial value of this well known sheltered and safe harbor, being one of the few such on the Pacific coast. Mr. L. J. Le Conte is the engineer, under Col. Mendell, in immediate charge of the work. In 1874, boats drawing over 5 or 6 feet of water could hardly bump along over the bar at high water and carry cargoes of not more than 60 to 100 tons.

Since 1878 ships and barks from 1,800 to 2,100 tons bur-

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den have been running regular trips and drawing from 16 to 16·5 feet of water. The completion of this year's work will admit of easy navigation for vessels drawing from 21 to 22 feet of water, which is ample for most foreign vessels that come over the bar off the Golden Gate.—*Min. and Sci. Press.*

How Opium is Produced in India.

[Calcutta Correspondent of San Francisco *Chronicle.*]

Owing to the ever poverty-stricken state of the Indian *raiat*, or husbandman, the government advances the means whereby he can engage in poppy cultivation. The nature of their engagements is about as follows: The cultivator undertakes to sow a *bigka*, or about one-twentieth of an acre, with poppy seed. For this he is given the requisite amount of seed. If a well has to be dug, he is not only given a sum on loan, sufficient to carry out his purpose, but also money enough to buy bullocks in order to enable him to draw water from the well when it is finished. This is termed the first advance, and is simply given to prepare his land for the sowing of poppy seed. The second advance is given when the plant begins to shoot above the earth's surface, and the third, when the plant is about to mature. In January or February the plant comes to maturity; in that state the pods are lanced in the afternoon. The opium is allowed to exude till next morning, when it is carefully taken off by an iron scraper. At the same time precaution is exercised to close the incisions by running the finger over the cuts. About five to six incisions suffice for the drawing of the juice.

The opium is placed in brass vessels, slightly tilted, so as to drain off the dew or any other watery substance. It is then manipulated and placed in new earthen vessels, and is thus kept till it is brought to the weighing station. The cultivator of poppies does not employ labor. His holdings are mere garden patches; so all the aid he requires, from the sowing of the seed to the maturing of the plant and the gathering of the opium, can be had from the members of his family. The whole of this work is done by himself, his wife, and his little ones. Many of these opium garden plats, worked by the man and family, amount to only one-sixth or one-twelfth of an acre, perhaps; in a few isolated instances one man is wealthy enough to own half an acre.

There are many reasons which conduce to this. First and foremost is that the native does not like to lease more land than he himself can plow and work. Even with the growth of opium, where so many untold advantages are offered for extended enterprise, the Indian husbandman prefers to give his attention to a tiny garden rather than to be put to the expense of working, with paid help, a few acres. His outlay is nothing, and thus he is enabled, at tremendous profit, to grow opium for sale to the government. He does not pay for help; manure is always handy, as human excrement only is used, and nothing is cheaper and more effective. Irrigation is equally simple. A rude well is sunk; two posts and a cross beam, over which is placed a wheel, form the only apparatus for the drawing of water. A rope is passed over the wheel and attached to it a huge leathern bucket, which is let down and drawn up by bullocks. The water is emptied into a reservoir; running from this are numerous drains, which carry off the water and flush the lands requiring moisture. The stronger members of the family are engaged in this toil, while the children, who in other lands would be deemed infants, make themselves generally useful in picking weeds and many other duties necessitating light labor.

Before the sun gilds the horizon, and while the dew is yet fresh on the grass, the family are astir, and from early morning till evening their entire attention is bestowed upon their crop, either in weeding, watering, or picking during the day; and sometimes at night, in keeping wild animals from intruding and destroying in a single hour the labor of years.

The wants of the husbandman are but few. Four mud walls and a thatched roof compose the family mansion; and in such a hovel will he live for generations. A scant cloth tied round his loins serves for coat and pantaloons. When he desires to appear to advantage a huge cotton sheet, thrown in graceful folds around his body, serves as gala costume on occasions of great festivity. His little children are in a state of utter nudity, even in the coldest weather; and when it is borne in mind that from October till February the weather is a great deal colder than it is in San Francisco, some idea of the hardy nature of native children can be formed. The women are somewhat better clothed; a simple petticoat and a gray-colored sheet has for the last three thousand years formed their attire. But, whatever money the husbandman gains, he converts into jewelry, which forms the real wealth of the native landowner, and is regarded by natives much in the same way as a European looks upon a bank account. In times of acute distress he can always part, even at a premium, with his wife's ornaments. The Hindoo religion demands that certain ornaments must be worn by married women. When the contracting parties are poor they make them of lead, but directly fortune smiles favorably they are exchanged for gold and silver. The small farmer lives with but three objects, that is, to load his wife with ornaments, to eat off brass platters, and to be able, on the marriage of his son, to make a grand display. To attain this end he will suffer years of deprivation and inconvenience, and his many years' savings will be wasted in a single week of jollification.

We can imagine how glad must be the raiat when the poppy plant has begun to exude opium, and when his opium has all been gathered he waits patiently for the order to march, with the fruits of his labor, to the weighing station. It depends entirely upon the season as to when the cultivators can bring their opium to the government stations to be weighed.

DISPOSING OF THE CROP.

As a general rule, the month of April is the commencement of the weighing season. Intimation is then given to the opium cultivators that they must present themselves on a certain day with their opium, in order to have it tested and weighed. In the districts where the poppy plant is cultivated all are astir, and grand preparations are made for a general exodus. The opium is collected safely in red earthen pots, which are put in wicker crates, and the whole family, with burdens on their heads, make for the weighing stations. The picturesque Indian lanes are crowded with these men, marching like sheep to their destination. They only travel during the night. The sultry heat of midday forces them to seek the grateful shelter of the gardens and groves so liberally planted along the dusty highways. Directly a halt is called, and preparations are made for the daily meal. After this is finished some lively spirit starts a story, recounting the savage doings of the stranger who rules the land. With terrified countenances and anxious ears they listen to these fabulous tales; but inwardly they bless the "white face" as they think of the money he is soon to disburse.

Many of these ignorant cultivators have never seen, in their life, a European; and accept with easy credulity anything detrimental to the character of their governors. No wonder is it then that the native approaches the sahib or gentleman with the most abject fear painted on every limb. He holds his breath when he hears him speak, and is ready to faint at the slightest display of anger or impatience. These sensational stories are generally propagated by rascally natives, who profit by the credulity of their countrymen in order to extort money. These men represent that nothing can be done without the bakshish or blackmail present, and they are the agents for the sahib, sent by him to collect toll. If the ignorant wretch demurs, his torturer paints a picture to which the torments of hell are but a trifle. The poor fellow, anxious to escape such calamities as he is threatened, pays the demand, and further presents his friend with a trifle in order that nothing should go wrong.

WEIGHING AND TESTING.

Early in the morning the weighing and tests commence. Notice is given to the cultivators, and they proceed to the factory, ranging themselves in a long line before the examining officer. Some men connected with the department then mix up the opium and take out a small quantity for examination. The officer, after inspection, marks the quality on the side of the earthen basin in chalk. The samples are again mixed up and tested with a solution of tincture of iodine. If it happens that the cultivator has been attempting to adulterate his opium with farinaceous matter the solution will discover the deceit. Experienced officers are alone trusted with this important duty, and it is expected of them to be able to distinguish the class of the opium as much by the feel and sight as by a chemical analysis. The consistency of the opium is easily told by a man who has been long at the work by simply turning the opium over with his hand or with the aid of a knife. If the opium is of a first-class quality the color is a rich brown, and it is so stiff that there is some difficulty experienced in turning. The poorer the quality the blacker the color and the thinner the consistency.

After the opium has been weighed and filled into separate jars according to its quality, they are sealed up and dispatched to the factory, where all the opium is again mixed up to a certain consistency and made into balls ready for exportation and sale at Calcutta. After the opium has once been delivered into the hands of the government officer, the cultivator has nothing more to do. He is paid so much by the pound; his former advances are deducted, and the connection between the *raiat* and government closes. When the balls are made they are packed into boxes called "opium chests," and sent down to Calcutta.

Mr. Bishop's Platinum Works.

At the recent convention of Mining Engineers in Philadelphia an excursion was made to the platinum works of Mr. Joaquin Bishop, of Sugartown, Chester County, Pa. Mr. Bishop is said to be the only platinum-worker in the United States, by which must be meant the only one who has an establishment devoted entirely to that metal. He has made a specialty of platinum working for forty years. In 1845 he took a premium, but at that time the demand for platinum was so small that it only occupied him one day in the month, using the metal principally for rivets to fasten artificial teeth. Before the engineers, Mr. Bishop melted a piece of platinum with the ease that a plumber melts lead. The intense heat used may be imagined when it is known that a steel file held in the blast burned like a piece of wood.

The Population Center of the United States.

Ten years ago the center of the population of the United States was about forty-eight miles east of Cincinnati, Ohio. The Superintendent of the late census announces that the growth of the great West during the past decade carried the center of population about fifty miles west, while the large increase in the Southern States carried it a little southward. The result places the center of population within the limits of Cincinnati.

Last Year's Petroleum Product.

The conditions which prevail throughout the petroleum trade—including the export, the home, and the producing elements—are far from flattering to those who look for better prices in the immediate future, as the following points show:

1. The production seems to have continued without decline for the past month, showing an average per day of 72,390 barrels, against an average per day for the preceding month of 72,214 barrels.

2. During the past month we have added to stocks in the region (by excess of receipts into the lines over the quantity shipped from the lines) 1,162,073 barrels. This quantity of addition to stock for one month is unprecedented in the history of the trade.

3. On taking a year's view of the production and shipments of the lines we find that for the twelve months of 1880, while the average daily production was 71,124 barrels, the average daily shipment was 37,100 barrels, showing a daily excess of production over shipment or consumption, for the year, of 34,024 barrels.

4. With a stock of over 20,000,000 barrels—which, with the existing relation of excessive production to demand, must continue to increase for some months to come—there is no reason for buoyancy in the carrying of this stock, and except for the plentitude of money which has prevailed for the past six months, we are of opinion that it could not have been carried at the existing prices.

5. While nothing of any importance has arisen within the past month to indicate an extension of the field, the fact that the production has been so well kept up in the severe winter months just passed rather indicates that we may expect an increase in developments and production as the weather becomes more favorable for operating.

Notwithstanding the exceptional severity of the winter now passing, the table of statistics of drilling wells shows that more wells were drilled during this winter than in any preceding winter; thus showing a persistent determination on the part of the producer to keep up the excess of supply, if possible.

We have endeavored to hope for better condition in the trade by looking at the definition of the territory and at the plethora of money, to support the excessive and growing stocks; but in examining carefully the statistics of the business, we are forced to the conclusion that a substantial appreciation of prices based upon the relation of supply to demand is not likely to come to us for yet awhile. It will take considerable falling off of production and a considerable increase of consumption for the present year as compared with the past year to overcome the excess of 34,024 barrels which we accumulated each day of last year.

Taking the great activity in the region, together with the slow rate at which production has declined in the past few months, we fear some months must yet elapse before there come to us substantial reasons for better permanent prices. —*Stowell's Reporter.*

A New Disease.

A boy lately died at the Sainte Eugénie Hospital, Paris, of hydrophobia. His saliva, taken four hours after death, has been found by M. Pasteur to have remarkable properties, causing what appears to be a new disease. Two rabbits immediately inoculated with the saliva diluted died in about 36 hours. Other rabbits were inoculated with the saliva or with the blood of the first, and death ensued even more rapidly. The process was several times repeated, and with like effects. The animal, in five or six hours, loses appetite, afterward becomes weak and paralyzed, and at length dies of asphyxia. The windpipe is a good deal congested and shows hemorrhage. There is also a swelling of the ganglions on either side, and of the groin and axillæ, etc. M. Pasteur has observed in the blood of the inoculated animals a small organism, or microbe, which (by his method of artificial cultivation) he finds good reason to regard as the agent of the malady. It is a very short rod, slightly contracted about the middle; a sort of aureola appears round it, probably due to mucous substance. It is somewhat like the microbe of chicken cholera, but differs entirely in its effects. Fowls inoculated with it are not in the least affected. It is further singular that while the rabbit is always so quickly killed by the effect of inoculation, the guinea-pig, so closely related to the rabbit, retains its vigor and appetite weeks after inoculation. Whether there may not in this case be a long incubation of the virus remains *sub judice.* The new malady seems thus far distinct from rabies in the absence of the usual incubation, the nature of the anatomical lesions, and the transmission by inoculation with the blood of the dead animal. Further, dogs inoculated with the boy's saliva died in a few days without presenting rabid symptoms. M. Pasteur, however, thinks it would be rash to affirm the absolute independence of the two disorders; and if rabies may be attributed to the presence of a microscopic organism, some hope is offered that science may find a means of attenuating the action of that terrible malady.

The Jubilee of the Hanover Technical Academy.

Doubtless many of our readers will be interested in the announcement elsewhere in this paper of the 50th anniversary of the Polytechnic Institute of Hanover, Germany, to be celebrated next June. The festival committee are desirous that all former students at that institution shall send in their names at once, even though they cannot accept the cordial invitation to participate.

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How the Telegraph is Kept in Order.

Every one has seen a "line man" walk up a telegraph pole as readily as if he were going up a flight of stairs. With a quick, nervous jerk of the foot he drives the spurs into the wood, and takes a firm hold every time. This dexterity comes from practice. It looks dangerous when a man is near the top of the pole, but that there is really little danger is proved by the fact that accidents very rarely occur. The men become accustomed to working at a great height, and mind it no more than sailors on a ship. An experienced man looks out for rotten poles and rotten cross beams, and once confident of these, he feels no further alarm. He hangs on by his legs as cleverly as a monkey by its tail, and thus has the free use of his arms and hands.

The spurs are of steel, and consist of a flat bar with a bend, which passes under the instep. A sharp point projects diagonally downward so as to bear a heavy weight from above. The greater the weight the deeper the point sinks, and the wood would have to be very rotten for it to slip. It leaves behind on the pole those queer little holes, which so much resemble the work of a woodpecker on a tree.

The line men are divided into two classes, climbers and ground men. The latter rank little higher than ordinary laborers, but in time, if they are ambitious to learn, they graduate into climbers. Climbers are paid from $40 to $75 a month, and at present are in great demand owing to the large amount of telegraph construction going on throughout the country. Ground men dig holes, plant poles, carry wire, and do whatever other labor is necessary.

The climber is provided with a pair of pliers, a hand vise, and a strap. He catches up the broken ends of wire, draws them together with the vise and strap, and splices them with the pliers. Care is taken to leave a certain slack, so as to allow for contraction by cold in winter. In large cities a number of climbers are kept constantly on duty at the central office, so as to be sent out at a moment's notice to repair a break. If a pole falls prompt action is taken. The fallen portion is chopped into sections and dragged out of the way of traffic. The stump is dug out. If a hole is to be dug, it is bored with a great earth auger, which does its work more neatly and quickly than spades.

There are different ways of raising the poles. If it is a very long pole—say seventy feet—a short pole is temporarily inserted and used as a guide. These long poles are becoming common in the city, for the reason that they raise the wires above the great mass of wires that covers the streets with a network of iron. Smaller poles are raised with pikes. A slanting ditch is dug from the surface of the ground to the bottom of the hole. The pole is laid in this, and this raises the upper end from the ground. Eight or ten men with pikes get under it. These pikes are long, smooth poles, with a sharp spike in the end. The men drive the spikes into the under part of the pole, and raise all together. They stand in such a way that the center of gravity of the pole falls among them, and there is no danger of its toppling to either side. Of the ten men eight will retain the advantage gained by the lift. The other two loosen their pikes, and, going in front of the others, insert their spikes lower down. Another lift is given, and this process is continued until the pole is raised to a perpendicular. The earth is then firmly wedged in about it, and it is ready to receive the wires.

The wires used are generally of size No. 8. For very long circuits Nos. 6 and 4 are used. The Western Union Telegraph Company has two No. 4 wires running to Chicago. The telephone companies use smaller wires, generally No. 12. This accounts for the greater damage done them by a sleet storm such as that of the 21st of January last.

The insulators are of glass, and cost from three to four cents apiece. Very many other devices and various kinds of material—stone, porcelain, rubber, etc.—have been used as insulators, but glass has been found to be the best and cheapest.

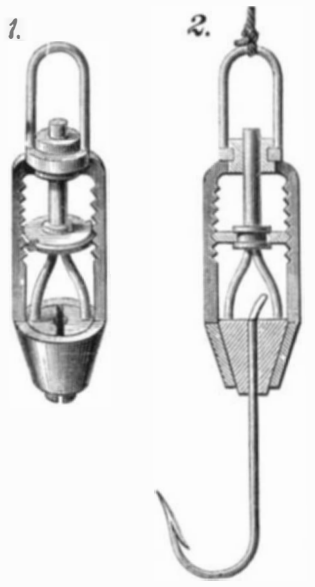
The chief operators of the offices in the large cities have charge of repairs for a wide circuit about them. At the American Union office, in this city, the chief operator has control to Philadelphia, to Hartford, and to Albany. At various stations along the lines between these points are test offices. The operators in these are required to be on duty at seven o'clock every morning. The chief operator in New York at that time calls up Philadelphia. Receiving a response, he tries every wire to Philadelphia. If all work properly it is all right. If a wire fails to work, the chief operator calls the test office nearest Philadelphia. If he again receives no response, he continues calling the successive test offices until he receives an answer. He thus locates the place of trouble, and then orders out the line men who are in waiting at the test stations on either side, who go along the line until they discover what is wrong. Another method is to call the test officers, beginning at New York, and cause each to ground its wire, until the point of damage is located.

It is easy to locate a break in the city where line men are constantly on the lookout, but in the country it is a different thing. Line men, who are necessarily climbers, are engaged by the month, and have each a certain tract of line assigned to their care. If the lines run along a railroad a man has control of an average of fifty miles. In case of a break he travels on a baggage or hand car to the place of trouble. These line men are under the control of certain head offices, and can be concentrated at any serious point of damage. In many instances the operators at unimportant stations also act as line men, and this is a part of their regular duty. Where the operator works on commission, he is paid extra for his line work. If the line runs on a turnpike away from a railroad, the line man has only fifteen miles under his care. He is obliged to live within call of the nearest station, and to be ready to go out at any time. Night or day, hot or cold, he must be prepared to start for the scene of trouble. The lines often run through desolate places, on the sides of mountains, and in wide prairies. The line man on horseback dashes from pole to pole, following the wires with his practiced eye. He often camps out all night, for he must not stop until the work is completed. In the winter some of these men travel on snow shoes, and lately, out West they have had the strange experience of digging down to the wires, where the snow was so deep as to cover the poles. It is a rule that the line man must go over the line once a week, to see that the poles are in order and to replace broken insulators. His hours of toil are often repaid by days of ease. He is alert for duty, but may have nothing to do for a long time. His pay continues just the same, and as long as he keeps within call he can do what he pleases.

The telegraph companies would like to run their wires under ground, but they find it won't work. They have been unable to insulate the wires so that they will work properly for any length of time. This compels the use of poles, which are generally of two kinds, cedar or chestnut. Cedar is the lightest, trimmest, and best looking, but chestnut lasts longer. Wires last from six to eight years. Rust is their great enemy, and smoke is another foe. Neither wires nor poles are expensive. Labor is the great item in making repairs, and in times when there is universal disaster to lines the companies have to pay high wages.—*N. Y. Sun.*

IMPROVED SWIVEL-HOLDER FOR FISH-HOOKS.

The engraving shows a simple and effective holder for fish-hooks of different sizes. The housing or head has at the top a cylindrical sleeve, to which is attached a swivel



HYMERS' SWIVEL-HOLDER FOR FISH-HOOKS.

loop for receiving the line. The bottom of the housing is connected with a conical sleeve for receiving conical jaws attached to a forked rod extending upward through the cylindrical sleeve. This forked rod carries a double cam, which engages notches in opposite sides of the housing, and holds the conical jaws in any desired position. The device is adapted to hooks of different sizes by inserting the conical jaws to a greater or less distance into the conical sleeve and fastening them by means of the cam.

This device facilitates the removal and replacement of broken fish-hooks, and admits of using on a line, hooks of a size suitable for any purpose. It answers as a sinker, and may be made small enough for catching minnows or large enough for the largest lines in use. It is a perfect swivel and a reliable holder. The inventor applies the same holder to rods, wire rope, etc.

This device was recently patented by Mr. C. Hymers, of 1601 Monroe street, St. Louis, Mo., who may be addressed for further information.

A Great Crucible Steel Casting.

Messrs. Jessop & Sons, Brightside Steel Works, Sheffield, have recently cast the largest crucible steel casting yet produced. It is a spur ring 28 feet in diameter, machine-moulded, and cast whole. To cast it 270 pots were used, each pot holding 80 lb. weight of molten steel. When the steel had been poured into the three large ladles, the plugs were removed, and it ran into the mould, the weight when cast being about 10 tons. In its finished state the weight will be about 8½ tons. It is, without doubt, by far the largest crucible cast steel casting of its kind that has ever been produced. Messrs. Jessop & Sons anticipate that this will be the beginning of an important trade with Lancashire mill owners, as they discover how much more durable steel wheels are than the cast iron wheels at present in general use. The firm have previously cast wheels 13 feet and 14 feet in diameter, but to 28 feet was a great leap. Now, however, they are prepared to undertake castings up to 34 feet. The operation of casting occupied 8½ minutes.

NEW INVENTIONS.

Mr. Henry B. Burin, of New York city, has patented a machine for threading bolts and tapping nuts, so constructed that when one tap or die is forced forward to do its work another die or tap will be withdrawn from its work. Thus the machine works continuously, and no time is lost in withdrawing the die or tap.

Mr. Major Thorp, of French Creek, West Va., has patented a cattle shed for use as temporary shelter in open pastures or fields. It consists of a roof pivoted to an upright support in combination with a windwheel and connecting devices, whereby the roof is turned so as to afford shelter from the wind coming from any quarter.

Mr. Elmer P. Newman, of Dimondale, Mich., has patented a copy holder for writing-books ruled parallel with the binding edge. The copy holder is formed of metal or other suitable material, having the ends bent under to form grooved flanges, which embrace the edges of the pages, and the upper longitudinal edge is bent over forward on the upper side to form a longitudinal flange for holding the copy, which is also held by the bent prongs on the lower edge of the holder.

Mr. Matthias Naumier, of Port Byron, N. Y., has patented an improvement in grain cradles, which relates to cradles made with either straight or bent snaths, and has for its object to give increased strength to the implement, and which consists in a novel system of bracing, which strengthens the snath, post, and fingers.

Mr. James E. Gowen, of Peabody, Kansas, has patented a self-adjusting weather strip for doors. It consists of a wood or metal strip, which, by means of springs, is caused to fit tightly against the casing of the door when the latter is closed.

Mr. Robert I. Draughon, of Perdue Hill, Ala., has patented a cotton chopper, which can be easily guided along a row of plants, whether straight or crooked, and around stumps or other obstructions, which will chop the plants to a stand without throwing the soil out of place, and which will allow the horse to walk at the side of the row

Mr. James H. Brown, of Boston, Mass., has patented an improved machine for sawing kindling wood, which automatically feeds the sticks to the saw. The principal feature of the machine is a wheel with radial arms and spring clamps, by which the sticks are presented to either a circular or reciprocating saw, and devices for thrusting the sticks longitudinally to insure the cutting of definite lengths.

Mr. Carl L. Præger, of Philadelphia, and Hubert F. Praeger, of South Bethlehem, Pa., have patented a self-adjusting wrench for bolts and nuts. The invention consists in a curved handle, one end of which serves as a lower jaw, and which is socketed and chambered to receive the shank and operating mechanism of the upper jaw. By means of a spring, slotted wedge, and lever, the upper jaw is adjusted and held. Some modifications of these devices are shown in the patent, but the principal features are as stated.

Mr. Arthur S. Pierson, of Harvard, N. Y., has patented a jointer for circular saws, so constructed that it can be readily adjusted to operate on saws of different diameters, and which will bring all the teeth to a uniform length. It is an ingenious, simple, and effective device.

Mr. George W. Miller, of Fawn Grove, Pa., has patented a rein holder for holding reins high enough above the dash-board of a vehicle to keep them out of reach of the horse's tail. It consists of a wire frame hooked on to the upper edge of the dash-board, a rectangular loop of the same material extending down in front to rigidly hold the frame, this loop being fastened to the front end of the box.

Mr. James A. Raney, of Cross Cut, Pa., has patented a sieve for middlings purifiers, so constructed that all parts of the sieve cloth will be covered by the middlings, thus preventing the air blast from passing through any uncovered portion of the sieve and the consequent waste of fine middlings.

Mr. Godfried Laube, of Wausau, Wis., has patented a car heater and ventilator, so constructed as to constantly reheat the air contained in the car, which allows a supply of fresh air to be introduced into the car when desired, which allows the hot air to be moistened before its introduction into the car, and which can be advantageously used for heating rooms and buildings.

Messrs. Herman H. Beckman, Claumer H. Beckman, and Christ Beckman, of Clayton, Iowa, have patented an improved windmill, so constructed that it turns more or less toward the wind according to the velocity with which the wind blows, and always remains in balance on its supports.

Mr. Richard Poindexter, of Bethania, N. C., has patented a tire shrinker, which is a cheap, simple, and effective device for holding a tire upon the anvil while it is being operated upon to shrink it, or upset it by hand forging.

Mr. William B. Van Hutton, of La Bahia Prairie (Burton P. O.), Texas, has patented a folding crate for the transportation of poultry, small animals, fruit, vegetables, etc, which is firm, strong, and durable, and may be folded so as to occupy little room in reshipment.

Mr. William J. Suttie, of New York city, has patented a nose piece for eye-glasses for holding the glasses and supporting the spring. The nose piece has several points of attachment to the lens or bow, and a socket for the end of the spring.

Mr. John Flanagan, of Newburg, N. Y., has patented an improvement in submerged pumps, which consists of a double cylindered pump provided with pistons composed of elastic diaphragms secured at their edges in the sides of the

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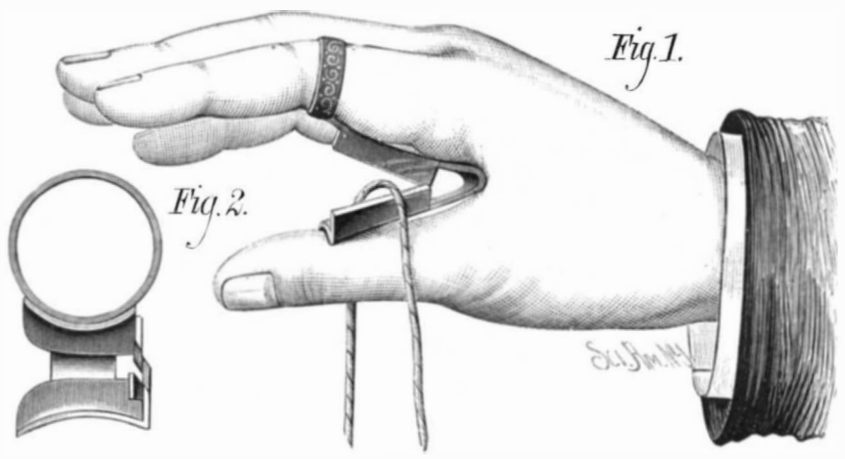
cylinders, and centrally in arched and perforated valve boxes, that are provided with ordinary hinged lift valves, said cylinders having open and cup-shaped bottoms forming suitable seats for ball valves, and having egress ports above the elastic diaphragm, the design being to submerge the pump and operate it by means of a rocking lever to lift and force water.

NOVEL SCISSORS.

The engraving shows a scissors attachment to the hand for cutting twine, tape, thin fabrics, etc. It is intended as a substitute for the shears or scissors ordinarily employed, and it consists of two short cutting blades attached to a V-shaped spring, one end of which is secured to a ring worn on the index finger. The spring is provided with suitable bearing plates for the thumb and finger, and the device is held as indicated in the engraving.

Scissors of this construction are always ready for use, and are not in the way when out of use.

This novel device is the invention of Mr. O. C. Haward, of Washington, D. C.



SCISSORS ATTACHMENT.

Hudson River Tunnel.

According to the *Railway News* the Hudson River Tunnel is advancing satisfactorily toward the New York shore at the rate of five feet a day. Two hundred men are employed digging out the dirt and putting in the iron and brick work. The tunnel is finished as they go along, and the work is much safer than under the old plan, which resulted so disastrously. A small tunnel, about six feet in diameter, is run ahead of the larger tunnel, which follows and incloses it; warning is thus given of the nature of the soil. The work is now in the south tunnel, which is now completed 290 feet from the shaft, and will soon be out as far as the north tunnel, which has been cleaned out, but not extended, since the accident. Both tunnels will then be carried along together. A caisson is in course of construction for beginning the work on the New York side.

NEW TELEPHONE TRANSMITTER.

BY GEO. M. HOPKINS.

The microphone, with pendants, figured and described by the writer in the SCIENTIFIC AMERICAN of Nov. 16, 1878, was among the earliest of telephone transmitters, and although the device was crude in appearance and exceedingly simple in its construction, it contained the germ of a successful instrument, and was favorably noticed in the scientific papers of Europe.

The transmitter shown in the annexed engraving is based upon the same principle, and, so far as the devices for varying the currents go, it is even simpler than the original microphone. Fig. 1 shows the exterior of the instrument, Fig. 2 the interior, Fig. 3 a detail of the transmitter proper, Fig. 4 a sectional view of the receiver, and Fig. 5 is a diagram showing the battery and line connections. Everything, excepting the battery, bell, and receiver, is contained in the box. In the center of the cover is formed the mouthpiece, behind which is placed the diaphragm, consisting of ordinary Russia iron of the thickness commonly used in stovepipe. It is 2¾ inches in diameter, and is held in position in a circular cast iron frame by two springs attached to the frame and pressing the diaphragm. The edge of the diaphragm is bound with soft rubber or felt. This arrangement, however, is not essential to the successful working of this instrument, as equally good results may be obtained when the diaphragm is clamped tightly at the edges between two rings fastened with screws to the front of the box.

To the center of the diaphragm *a* (see Fig. 3) is attached a metal clamp, *b*, which supports, in a horizontal position, a cylindrical pencil of hard electric-light carbon, ¼ inch in diameter and 1 inch long. A disk, C, of battery carbon 1¼ inches in diameter and ¼ inch thick, is grooved around the edge and wound with fine copper wire, which terminates in a flexible spiral connected with the upper hinge of the box. The carbon disk is suspended by a silk thread from a spool formed on the inner end of a screw extending through the box cover, and capable of being turned so as to raise or lower the carbon disk, as may be required. The disk is slightly inclined from the perpendicular, and the line of contact between it and the carbon pencil is a little above the center of gravity of the disk. This arrangement of the two carbons prevents any marked break in the local circuit, as the disk tends to rock on the carbon pencil rather than fly from it when the diaphragm is set in vibration. The carbon disk has been saturated with melted paraffine in some instances with beneficial results.

The clamp which holds the carbon pencil is electrically connected with the lower hinge of the box. From the hinges the connections may be more easily traced in Fig. 5 than in the perspective views.

This diagram shows all of the connections for one end of the line, both ends being alike. The connections are shown in condition to call or receive a call. When a call is received the current passes from the line through the switch, E, button 2, key, bottom or outer contact of the key, bell-magnet, and ground wire, A, to the ground. When the key is depressed to call a distant station, the key touches the inner or top contact, on the battery wire, B, sending the current through the button 2, switch, E, and line to the bell and ground of the distant station. The current returns by the ground and wire, A, to the battery. After calling, the switch, E, is moved to button 1, and the switch, F being connected with the switch, E, by an insulating connection, is at the same time moved to button 3, as shown in dotted lines. Now the line connection is through the switch, E, button 1, wire, G, secondary wire of the induction coil, and receiver to the ground. The switch, F, when turned as described, completes the local circuit, the current passing from one cell of the battery through the wire, D, switch, F, button 3, transmitter, primary of the induction coil, ground wire, A, and wire, C. The connections are now correct for talking. The diagram shows the connections adapted to the class of transmitters employing but a single battery element, and to a line requiring several cells of battery to call. If a single cell of battery is sufficient to call, the posts of the wires, B D, will be connected together.

Fig. 5.- Telephone Connections.

The button which moves the switch extends through the side of the box below the hook upon which the receiving instrument is hung. This arrangement insures the readjustment of the switch after talking, as the receiver cannot be hung up until the switch button is pushed in.

Three layers of No. 18 silk covered wire form the primary of the induction coil, and the secondary consists of some ten or twelve layers of No. 36 silk covered wire.

The receiver, shown in section in Fig. 4, has a diaphragm of the usual size mounted in a hard rubber case 2⅛ inches in internal diameter and 1 inch deep. The bobbin of the usual style is placed on a soft iron core having a large convex head, and held in place by a screw extending through the bottom of the case. A soft rubber button is placed between the casing and the convex end of the core, and eight curved permanent magnets, one-eighth inch thick and one-quarter inch wide, touch the convex end of the bobbin core and are pressed upward into contact with the diaphragm by a rubber ring at the bottom of the case. The diaphragm at its points of contact with the magnets is freed from japan or oxide, and the ends of the magnets are let into notches cut in the case, so that when they press upon the diaphragm the latter is backed by the mouthpiece.

This receiver is very compact and light, and as to efficiency it is all that can be desired.

The transmitter works well, is perfectly simple, requires no particular care in its manufacture, and never gets out of adjustment.

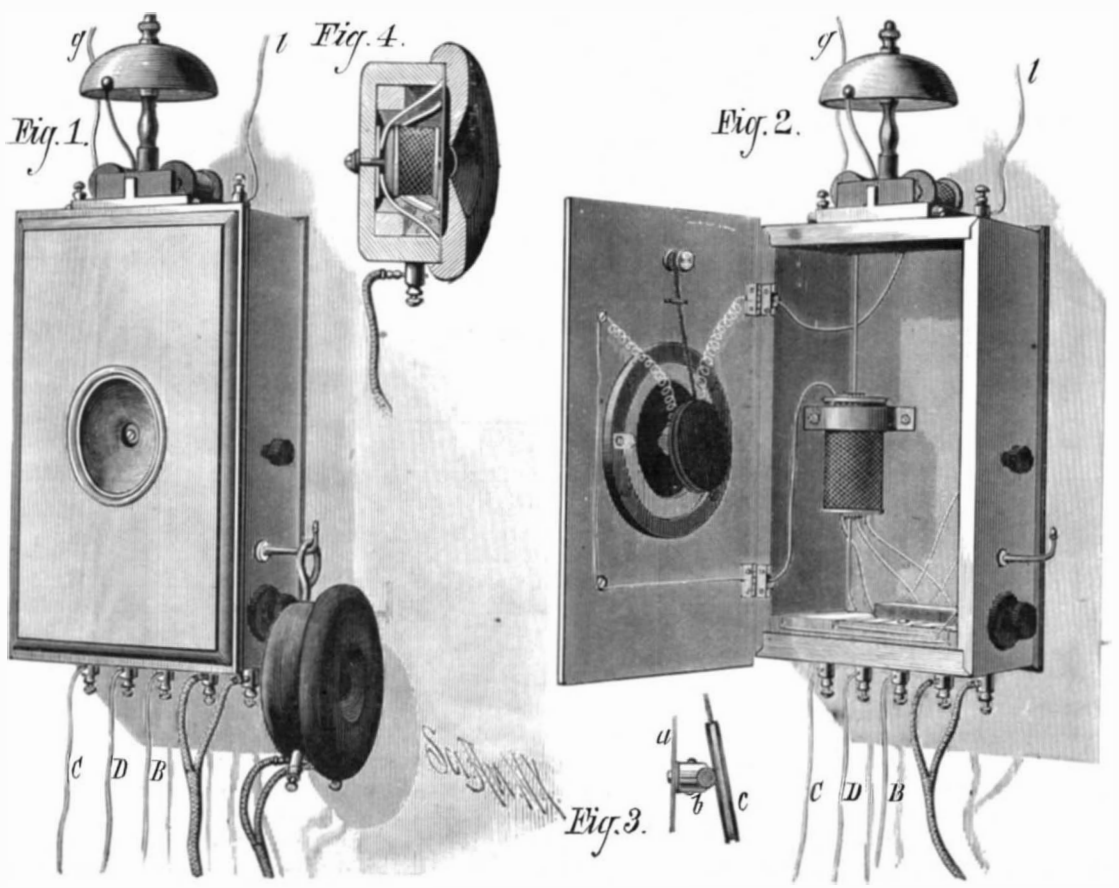
Telephonic Electric Condensers.

In order to make a condenser sing it is merely needful to connect its armatures with the extremities of the secondary helix of an induction coil, interposing in the primary helix a battery and a microphone analogous to the transmitter of Reiss. If thus arranged the apparatus merely reproduces musical sounds. The author interposed a battery in the secondary helix of the coil; *i. e.*, he connected one extremity of the induced wire with one of the poles of a battery, the other pole communicating with one armature of the condenser, the second armature being attached to the other extremity of the induced wire. Articulate sounds are then reproduced with perfect distinctness. M. Th. du Moncel observed that this fact confirms his ideas on the origin of sounds in the telephone.—*A. Dunand.*

A Reception of Professor Bell.

A grand reception has been recently given by the Mayor and Corporation of Brantford, England, to Professor Bell. The reception was attended by about 300 people. After the presentations the Mayor presented on address to Professor Bell, to which the latter made a suitable reply. An address was then presented by the Board of Trade, to which a reply to the following effect was made:

It might not be uninteresting to them, although not connected specially with trade, if he were to make some remarks upon his recent discovery of the photophone. He described it as at present rather a contribution to science than to the world's utilities, but he looked forward to important practical applications. Among them he specified communication between passing ships at sea, lighthouses and the shore, and in case of war communication with distant places could be received without the necessity of an intervening wire. He then described the apparatus and experiments, and added that he had spoken for a distance of 800 or 900 yards, and had sent the musical sound a mile and a quarter, but he saw no reason to anticipate any difficulty but that of the convexity of the earth in transmitting articulate speech by light to any distance.



SIMPLE TELEPHONE TRANSMITTER.

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THE CHEIROMELES.

BY FREDERIC A. LUCAS.

If the curious bat (*Cheiromeles torquatus*) shown in the accompanying engraving is not the most singular member of the order cheiroptera, it certainly has very few rivals. The skin is thick, almost naked, and marked with deep wrinkles, so that the animal has something the appearance of a diminutive pachyderm. Like the other members of the small sub-family to which it belongs, the cheiromeles has long, narrow wings which fold compactly up, very little membrane in front of the fore arm, and feet entirely free from the wing membrane. It thus has greater freedom of movement than bats usually possess, and the creature can crawl so rapidly over the ground that it is not an easy matter to pick it up. The first toe is quite separate from the others, and is furnished with stiff hairs along the outer edge. The thick round tail is free for more than half its length, and the interfemoral membrane is movable upon it, thus allowing the extent of surface exposed to the air to be increased or diminished at will, and probably aiding the animal in its rapid turns while in pursuit of the insects on which it lives. The lips are thick and extensible, and the teeth sufficiently large and sharp to crush with ease the hardest beetles. Beneath the neck, running from shoulder to shoulder, is a deep fold or sac, which receives an oily secretion from glands situated in the upper pectoral muscles But the most peculiar feature of the cheiromeles, and one not found in any other species of bat, is a sort of inverted pocket situated beneath either arm pit, formed by a fold of skin running obliquely downward and inward from the elbow. Dr. Dobson suggests that these pouches are to support the young, which otherwise would be unable to maintain a hold on the naked body of its mother during flight. The mammæ are situated at the upper end of these "nurse pouches." As both male and female have these pockets it is probable that when two young are born the male takes charge of one. This bat is nearly eight inches in length from nose to tip of tail, and twenty-two inches across the wings. It is of a dingy lead color, and dwells in holes in trees. Although not at all common, the cheiromeles has quite an extensive range, being found in Java, Borneo, Sumatra, and the Malay Peninsula.

It lives only in wilds far from the habitations of men, where its peculiar voice may be frequently heard; it has some similarity to the notes of the wild wood-pigeon, but is far louder and accompanied with guttural tones, and is uttered so suddenly and with such vehemence that it has a very startling effect. Sometimes one can catch a glimpse of these birds as they walk proudly upon the sand banks near the rivers. If they are approached they fly up and resemble in the broad surface of their wings, their coloring, and flapping, the urubu, or black vulture. They perch upon the top of thickly foliaged forest trees, and though they can seldom be seen, their loud, shrill voices indicate their whereabouts. In the brooding tiny they are found in pairs, sometimes four or six individuals joining together. The food of the horned screamers consists chiefly of vegetable substances, such as the leaves and seeds of aquatic plants, in search of which they wade through the morasses. Their flight is strong and easy, their walk erect and bold, and their mien lofty like that of the eagle, Their nests are found upon the ground in the forest marshes not far from rivers; they contain two large white eggs, and consist only of a few twigs. The young follow their parents almost as soon as hatched. Their flesh is not edible. Their quills are often used for pens.

CHEIROMELES TORQUATUS.

THE HORNED SCREAMER.

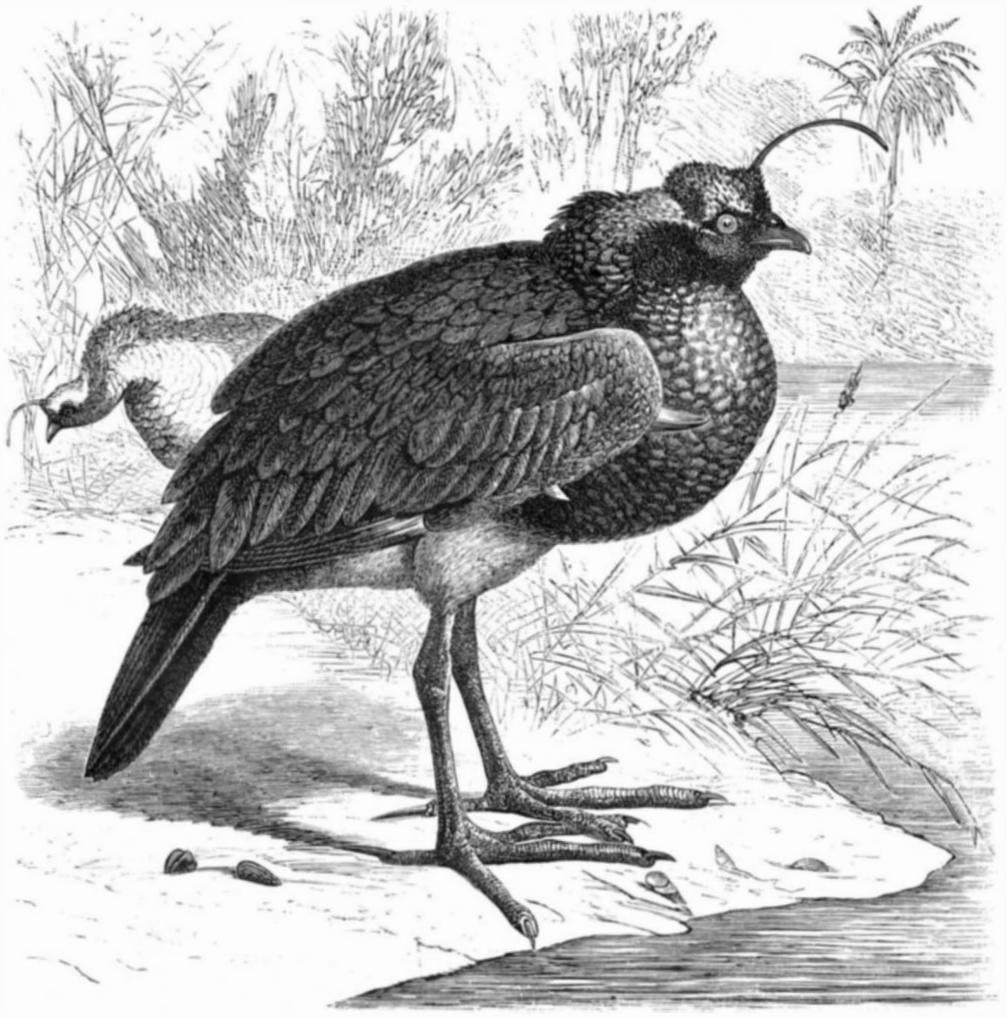
The horned screamer (*Palamedea cornuta*) is found in Central Brazil and northward in Guinea and Columbia. On account of the horn on the crown of its head, the thickly feathered wings, short head, and neck feathers, it will be recognized as a representative of the family of horned birds.

The horn, fastened only in the skin, rises from the brow about five-eighths of an inch from the root of the bill. It is slender and from four to six inches long, standing nearly erect, but slightly curved toward the front. Its diameter at the root is one-eighth of an inch, and it may properly be compared to a catgut string

The horned screamer is armed with two spurs on each wing; the upper one on the bend of the wing is triangular and very pointed. It is about nine-sixteenths of an inch long and almost imperceptibly curved outward. The lower one is only five-sixteenths of an inch long, almest straight, and very strong.

The soft velvety feathers of the upper part of the head are of a light gray, black toward the tip. The throat, neck, back, breast, and tail are blackish brown, the shoulders and large wing coverts are of a glistening metallic green, the lesser wing coverts a muddy yellow at the roots, the upper half and the upper part of the breast are a clear silver gray with a broad edge of black, the rump and belly are pure white. The eye is orange colored, the bill blackish brown, white at the tip. The horn is light gray, the feet a darker gray.

The horned screamer is a large and beautiful bird, about the size of a common turkey, and is an ornament to the primeval forests of Brazil. In traveling from the south to the north it is not generally found until the sixteenth degree of south latitude is reached, where it may be seen in large numbers.



THE HORNED SCREAMER—(*Palamedea Cornuta.*)

The horned screamers when domesticated are confiding and obedient, associate with fowls, and are peaceable when unmolested. They always place themselves on the defensive toward dogs, and know how to use the spurs on their wings to such purpose that they put them to flight with a single blow.

Wool Velvet.

According to *L'Ingénieur Universel* an extremely novel and interesting process has recently been discovered by M. Puech, of Mazamet, France, by which the wool on sheepskins may be transformed into velvet. Up to the present time sheepskins tanned with the wool on have only been used for mats, linings of coats, etc., and the wool not having been subjected to any preparation, is always matted or curled. Seeing that the innumerable fibers are naturally disposed in a most regular and perfect order, eminently fit for velveting, M. Puech conceived the idea of cleansing the skin and wool of all impurities, and of so preparing and dressing them that the hairs would be well preserved and not entangled one with the other, the occurrence of the latter contingency being, of course, fatal to the success of the operation. After long and continuous experiments success has been achieved in the following manner: The *modus operandi* is divided into ten principal operations, the 1st, 2d, 3d, and 4th relating to the complete scouring of the skins on the wool side and cleaning them on the flesh side, and the 5th, 6th, 7th, 8th, and 9th to tanning and preparing the skins so that the perfect adherence of the wool to the skin is insured; finally, by the 10th operation, the skin is submitted to special machines for preparing the wool like velvet.

The following are the ten numerically arranged and successive operations referred to as constituting the process: 1st. An ordinary water bath is prepared at a temperature of from 45° to 50° Cen., to which a scouring substance of some sort is added, such as crystal or soda salt, soap, and so forth, in which the skins are steeped. 2d. If dry skins are operated on, such as come from America or other foreign country, they are steeped eight to ten minutes, but for fresh or recently slaughtered skins three or five minutes will suffice. The skins are then passed to a pressing roller of sufficient power to separate the burrs, yolk and other impurities. 3d. The skins are then as quickly as possible and while still warm submitted to a beating machine. The object of this beating operation is to purify them of all foreign matters, and at the same time to wash them thoroughly with cold, tepid, or hot water, which is made to fall in abundance between the drum of the machine and the apron supporting the skin. 4th. The skin on the flesh side is then passed to this same beating machine, which cleanses it, renders it more supple, and disposes it to receive the tanning matter. 5th. The skins thus prepared are steeped about one hour in tepid water, or four to five hours in cold water, which operation completes the softening. 6th. They are then passed to a pressing roller to extract all the water and leave fifteen to twenty per cent of moisture. 7th. On the flesh side is applied, either by hand or mechanically, one of the known drugs composed *ad hoc*, constituting the tanning matter. In order that the action on the leather may be complete the skins are placed in piles for five to ten hours, after which they are hung up to dry. 8th. The leather is now moistened with a rag or sponge, and the skins are replaced in piles for five to ten hours to soften the leather and permit of cleaning the flesh side. 9th. The hides are stretched and are then passed to the softening iron, always on the flesh side, and the skins are scoured and tanned. There now remains only the 10th, or velveting operation, which is effected thus: By the scouring and beating system the staple of the wool is perfectly preserved and each fiber is in place. It then suffices to pass the skin on the wool side to the gig machine, which replaces all the staples where they had been displaced in the tanning operation, and causes the skin to part with what little tanning drug it may contain in the wool. After this the skins are passed to the dressing machine, which commences to dress the wool, cards it also a little, and prepares it for velveting. The skin on the wool side is then gently sprinkled and beaten with a rod by hand or mechanically. This is one of the most essential operations, as the wool being then damp the rod raises it and hastens the preparation of the velvet. The skin has now to be dried and sheared with cloth shears or other apparatus having the same effect, and this completes the process.

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If it is desired to color the velvet, it is after the 4th operation that the dyeing takes place, the other operations then succeed as has been described. If the color necessitates boiling or temperature approaching it, which would be inconvenient to an untanned skin, the operation is performed after the 7th operation, and this 7th operation is renewed after dyeing and then followed by the subsequent operations.

Animal Reasoning.

A correspondent of *Nature*, writing from Cambridge, Mass., says: A lady, a friend of mine, was at one time matron of a hospital for poor women and children which was maintained by subscription. One of the inmates was a blind girl who was there not as a patient, but temporarily till a home could be found for her. She had learned to feed herself, and at meal times a tray containing her dinner was placed on her knees as she sat in a comfortable chair for her special convenience in feeding herself. One day while she was eating, the pet cat of the establishment placed herself before the girl and looked long and earnestly at her, so earnestly that the matron, fearing the animal meditated some mischief to the girl, took her out of the room. Again the next day, at the same hour, the cat entered the room, but this time walked quietly to the girl's side, reared herself on her hind legs, and noiselessly, stealthily reached out her paw to the plate, selected and seized a morsel that pleased her, and, silently as she came, departed to enjoy her stolen meal. The girl never noticed her loss, and when told of it by her companions laughed very heartily.

It is evident that the cat from observation had entirely satisfied herself that the girl could not see, and by a process of reasoning decided she could steal a good dinner by this practical use of her knowledge.

The White Alligator.

Writing to the *World* from Ca-Manos-Alto, at the foot of the great rapid of the Rio Negro, Brazil, the explorer, Mr. Ernest Morris, says:

Over one of the camp fires the crew are roasting with boisterous merriment a live alligator (*Jacaré tinga*), about five feet long. When I asked why they did not kill the animal before roasting, the pilot, who is always the spokesman of the party, answered that it would spoil the meat. The white alligator is highly relished by both whites and Indians. It differs entirely from the *Jacaré assu*, or large alligator, rarely attaining five feet in length, and is distinguished from the larger species by its pointed nozzle, somewhat rounded tail, whiter color, and its freedom from the *acatinga* (or smell). Though it is found throughout the whole course of the Amazon, it abounds more in clear-watered rivers and creeks. I have often found this alligator in streams of the high hills, miles away from any river or lake, and have frequently seen the skulls and bones in the forest. That it travels far and well on land there can be no doubt; and the Indians say that its eggs are deposited in the forests. The flesh resembles veal in appearance and has a fishy taste.

The Excretion of Lime.

Many investigations have been directed to the determination of the amount of lime excreted in various pathological states, and many observations exist of changes in the excretion. One of the earliest observations was that of Prout, relating to the phosphatic diathesis, which was recognized by the deposit in the urine. Later an increased excretion of earthy phosphates was assumed to exist in many diseases of the nervous system and kidneys, and a diminished excretion in some other diseases. Beneke studied the mode of formation of oxalate of lime in the organism, and Senator has directed attention to the variations in the amounts of lime excreted in various conditions. The last contribution to the subject is contained in an article in the current number of Virchow's *Archiv*, by Dr. Schetelig. The method of estimation which he has employed is the precipitation of the lime by oxalic acid; the precipitate was dried and dissolved in hydrochloric acid, and the lime precipitated by soda. The phosphoric acid was estimated by means of acetate of uranium.

The first question to determine was the amount excreted by normal individuals, since the statement of different authorities on this point differ largely, varying from 100 to 500 milligrammes. Experimenting on himself during eight days, the excretion was found to vary from between 350 and 500 milligrammes. It is greatest, like the other solid constituents, in the morning urine, and, when no breakfast was taken, the minimum was found in the urine passed just before the mid-day meal. Five hours later the quantity was greater; ten hours after the meal it was greater still. The excretion seems thus to bear relation to the material taken at a meal, and to the process of intestinal digestion. In starvation, accordingly, the excretion of lime almost ceases. On two days the mid-day meal was omitted, and on a third only an extremely small quantity of solid food was taken; the morning excretion of lime fell to an average of 70 milligrammes, and once only 35 milligrammes were noted.

The long delay after food before the amount of lime is increased in the urine makes it probable that it passes through the organism in some other path than, for example, that taken by the haloid salts, which find their way into the urine in a very short time. From a long series of observations, the conclusions were drawn that carbonate of lime, even when given in very small quantities and with much water, is quickly absorbed and appears in the urine. The lime phosphates of meat are, to a small extent, transformed into chloride or directly absorbed, but for the most part pass with the albumen into the small intestine and into the lymphatic vessels, but need the presence of the hydrochloric acid of the stomach for their preparation for absorption. The ingestion of water assists the passage of the lime into the vascular system in a very striking manner. No pathological increase in the excretion of lime could be demonstrated in chronic diseases of the thoracic organs or of the central nervous system, and seems to be improbable. The amount of phosphates in the urine is apparently regulated by the process of intestinal digestion and absorption, rather than by the conditions of the cell life of the body. The best means of counteracting the effect of the ingestion of lime is the free administration of water and chloride of sodium, or of hydrochloric acid.—*Lancet.*

Elasticity of Wires.*

The experiments described in this paper form a continuation of experiments undertaken in connection with the work of the Committee of the British Association for commencing secular experiments on the elasticity of wires.

Long-continued application of stretching force increases to a very great extent the tensile strength of soft iron wire. Thus in experiments described to the British Association in 1879 (see report of the committee just referred to), a particular very soft iron wire was shown to have a breaking weight 10 per cent higher, if the weight necessary to break it is applied half a pound at a time per day, than it has if the breaking weight is applied half a pound at a time at intervals of say two minutes. It was found, also, that this wire, quickly broken, extends before breaking by as much as 25 per cent of its original length; whereas if the application of the stress is very slow, the extension is not more than 5 or 6, or perhaps 8 per cent. Further experiments have been undertaken on this subject, and are still in progress.

Using a continuous arrangement for applying the stretching weight and employing some very soft iron wire which had been specially prepared, and which was used in former experiments, the greatest weight which could be rapidly put on the wire without breaking it was determined. It was found that with a weight of 41 pounds gradually applied in 6¼ minutes, the wire stretched by 24·4 per cent of its original length, and broke 18 minutes after the weight was put on. With the same weight 41 pounds applied in 6¾ minutes, the wire stretched 22·1 per cent and broke in 24 minutes. With 41 pounds, however, applied in 7¼ minutes, the wire stretched 18 per cent and did not break. This weight, therefore, appeared to be just as much as the wire would bear with this method of applying the weight. Accordingly it was applied to a great number of wires for different lengths of time for the purpose of hardening them, and arrangements have been made for keeping a number of wires for very long times with this stretching force applied to them. The amount of extension produced by the application of the hardening stress was observed in each case.

After the hardening stress had been applied for a certain time the additional weight necessary to break the wire was determined, and also the additional elongation before breaking, which was in all cases almost insensible. The wires seemed permanently set in about forty minutes from the time when the hardening stress was applied. They did not alter in length till just before they broke, when they generally stretched 1 or 2 millimeters on a length of about 1,800 mm. The following table shows some of the results out of a great many that have already been obtained.

Length of wire used.	Hardening stress applied in pounds.	Time taken by continuous machine in applying the hardening stress in minutes.	Extension produced by application of hardening stress in per cent in original length.	Duration of hardening stress in hours.	Total breaking weight after hardening
150 cm.	41	6¼	24·4	Broke with 41 lb.	
"	"	6¾	22 1		
"	"	9½	18·7	24	47·44
"	"	7	17 2	27	47 5
"	"	8	17 3	117	48 13
"	"	7⅛	18·1	790	52 31

Curves have also been obtained and were exhibited to the section showing the extension with gradually applied weights both of a number of wires and of the different parts of the same wire; also curves showing the extension at different intervals of time from the beginning of an experiment in which the wire is running down under a weight sufficient to break it finally.

The author acknowledged the great assistance that he had received from Mr. A. C. Crawford and other students in the Physical Laboratory of the University of Glasgow.

Similar experiments are in progress on wires of copper and tin, and it is intended to test gold wire very soon, as it will probably give interesting results, and results very different from those given by soft iron wires.

* Strength and Elasticity of Soft Iron Wires. Abstract of a paper read at the British Association, by J. T. Bottomley, M.A., F. R.S.E.

The Egyptian Obelisk Presented to New York.

The last act in the history of the obelisk removal was its official presentation to the city of New York by the United States, at the Metropolitan Museum of Art, February 22.

In his presentation speech, Mr. Evarts, Secretary of State, gave some interesting particulars touching the removal of obelisks from Egypt:

"The first was taken by the conquering Assyrian, a monarch of great mark in his time, and remembered through all ages since—known better to us, and more easily, by his Greek name of Sardanapalus. He took an obelisk to Nineveh, the capital of Assyria, when that empire was the mistress of the world; and that movement was, indeed, a movement which embraces many of the important incidents of even a great voyage like this which our obelisk has taken. Although there are no records of the precise method or route of transportation which the Assyrian took for his obelisk, yet it is very apparent that, as it must have been water-borne, it was taken to the Red Sea, then down the Red Sea into the Indian Ocean, then up the Persian Gulf to the mouth of the Euphrates, and thence to Nineveh, beyond the navigation of the river. This route, speaking roughly, must have included some fifteen hundred miles of journeying, and we are somewhat at a loss to understand how the method and vehicles for such a transportation could have existed at that age, we have so little record of them. But as the obelisk undoubtedly got to Nineveh and could not go across the desert by land, it must have made this circuitous route for upward of fifteen hundred miles.

"The next conqueror that assumed to take obelisks from Egypt was Rome in the time of the emperors. They took as many as fifteen, one after another, and twelve now remain in Italy. This brings us to the period close upon the Christian era; and in the time of the famous Cæsar, Julius, and on through his successors, Egypt, subject and abject, yielded up these treasures of its art and of its pride to a conquering spoiler.

"Now came the Empire, with Byzantium as its capital; and it, too, demanded from the wealth of Egypt the contribution of an obelisk to mark the domination of this city. Byzantium, now Constantinople, contains the obelisk then taken; and this closes the transactions, or transportations, in ancient times. All subsequent movements have been within this century. The French and British, as we know, made Egypt a battlefield at the commencement of this century. Egypt, recognizing its obligations to England, as early as 1819 had offered an obelisk to England, the great power of the earth. But the difficulties of transportation and the expense seemed so serious to the mother country that that gift remained lying on the sand at Alexandria; nor was any movement made for its transfer until the year 1877—completed in 1878. The height of English ingenuity and experience in architecture of naval vessels, in navigation, and in engineering, had only taught the English that an obelisk could not be carried in the hold of a ship; and the experiment was made of building a vehicle around the obelisk that could float it and itself and be towed by a steamer—giving this abundant opportunity of safety, between the sinking of the obelisk and the sinking of the tow; the tow might cut loose from the obelisk and leave nothing therefore for the chance of loss of life. The experiment was not such as to encourage imitation by us, even if Captain Gorringe had not had that faith in a ship which had been his cradle from his youth, that if it could carry all the men and all the armor and all the cargoes that modern civilization burdens ships with, it could carry an obelisk. The caisson, or whatever it was called, in which the English obelisk was inclosed, was abandoned in mid-ocean, and the experiment was delayed—delayed for fifty years and more from the time the gift was made until the courage and the skill were present to undertake it. Some adventurers at sea picked it up, brought it into London, took it into a Court of Admiralty, and received £5,000 for executing what the original arrangements had failed to do.

"The French obelisk was given in 1823 or 1824, by the Egyptian Government, doubtless in execution of a readiness on their part to favor the plan of Napoleon, to make that transfer as a part of his triumph to ornament his capital. In 1831, just fifty years ago, Louis Philippe undertook the transportation, and placed the monolith where so many good Americans have seen it in Paris, in the Place de la Concorde. It is noticeable that the expense of this transfer across the Mediterranean, or around by the Bay of Biscay, whichever way it went, cost nearly $500,000, quite five times as much as our enterprise, under the lead and the execution of Lieutenant Commander Gorringe."

The following statement of the transportation expenses of our obelisk was furnished by Lieutenant Commander Gorringe:

Net cost and expenses of removing, transporting, and erecting the New York obelisk	$73,844 03
Net cost and expenses of removing, transporting, placing, and repairing the pedestal, steps, and base	28,732 00
Total net cost	$102,576 03

This sum does not include the cost and expenses of the steamer, which must be recovered from her sale. The word "expenses" is used to designate and include amounts that have been paid for the use of the money needed to carry on the work. These amounts aggregate $15,973 03. Deducting this sum from the total net cost, the actual cost of lowering and removing, and transporting 5,382 miles by water and 11,520 feet by land, and erecting the New York obelisk and its pedestal and base, is $86,603.

The entire cost of the undertaking was defrayed by William H. Vanderbilt. The credit of carrying it out under great financial and political difficulties, at his own personal risk, is due to Commander Gorringe.

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Nasal, Pharyngeal, and Bronchial Catarrh.

The complaints above named are very prevalent throughout all those regions of this continent where sudden changes in temperature are frequent. Acute attacks are, in popular language, called "cold in the head," "sore throat," and "cold on the lungs." The latter is, however, most generally confined to the bronchial tubes, and consequently the popular name is a misnomer. We find in the "Proceedings of the Medical Society of the County of Kings, N. Y.," for February, 1881, a very extended discussion of the relation of locality to the prevalence of this class of diseases. It is supplied in a report of the Committee on Hygiene of the society, which has made an apparently successful attempt to determine whether catarrhs are more prevalent in Brooklyn than New York, this being a popular notion.

To local readers it will be of interest to know that this notion is not based on facts, catarrhal affections being, in the opinion of the committee, equally common in both cities. This opinion is based upon statements supplied by the oldest and best physicians in both New York and Brooklyn. For the general reader, however, the conclusions of the committee have value beyond the decision of the main point in issue.

We may properly state here that the course pursued to gain the required information was systematic and thorough. It embraced inquiries into the meteorological conditions of both cities for a number of years, an examination of the received authorities in printed works upon the relations of catarrh to climate, locality, and individual constitution and temperament, inquiry into the tendency of repeated catarrhal affections to induce tuberculosis or real pulmonary consumption, and interviews with local physicians of character and large experience.

It was found that the climatic difference between the two cities is very slight indeed.

It was also determined that no real change of climate has occurred along the line of Atlantic coast cities for indefinitely long periods of time, although, apparently, there have been brief cycles of heat and cold, of moisture and of dryness, succeeding each other under the operation of some unknown law.

CAUSES OF PHARYNGEAL CATARRH.

These, as enumerated by various authors, are: "Personal idiosyncrasy, straining the voice as in shouting. As secondary to nasal catarrh, indiscretion in leaving off clothing, or in getting feet wet; rude changes in the temperature of the air; local irritants, as tobacco, spices, and hot drinks; certain atmospheric causes as yet unknown; thus, in spring and autumn catarrhs often prevail *endemically*. The same causes (perhaps, *e. g.*, pollen) sometimes operate to produce the epidemic varieties: *e. g.*, influenza and hay fever are symptomatic of certain exanthemata.

"Generally 'moist and cold climate with frequent and sudden and severe variations of temperature.'

"Biermer draws attention to chilly winds with increased moisture.

"Lebert noticed this before, as also the effect of sudden depressions of temperature. He finds that the 'fair weather' years are *not* the best, but those when the transitions of the seasons and the changes of the temperature are *least marked*. He has also proved that the extremes of temperature and pressure produce less trouble than *sudden* changes. He shows that in Switzerland 50 per cent of all catarrhal bronchitis is in the first *four months of the year*. Heller obtained nearly similar results at the Vienna Hospital."

NASAL CATARRH.

The like causes produce nasal catarrh, except such as in the above enumeration relate to exercise of the voice and sequelæ of nasal catarrh.

CAUSES OF BRONCHIAL CATARRH.

"The sudden cooling off of the whole body, or a part of it, *i. e.*, the process of 'taking cold.' 'Inhalation of dust,' affections so well shown up by Hirt. Catarrhs from inhalation follow the following order of frequency: 1st. Inhalation of *vegetable* dust, next metallic dust, then that of animal origin, and least noxious is mineral dust. Inhalation of gases and vapors—vapors most often of nitric and sulphuric acids—then of hydrochloric acid. Catarrh from iodine inhalation is very rare. Hirt has noticed *marked tolerance* of these *irritants after a few attacks of catarrh*. He finds a few vapors that are not only innocuous, but seem to diminish a disposition to catarrhal disease, and even to hasten the favorable termination of an already existing catarrh. In this class belong vapors from oil, from glue, burning tar, and *salt air*.

"The theory that an undue amount of ozone in the atmosphere is a cause of catarrhs has not been established. During the prevalence of the epizootic or influenza among horses a few months since, the daily tests at Central Park showed almost an entire absence of ozone from the atmosphere."

The committee expresses the opinion that "though climatic and city influences have much to do with the creation of catarrhs, yet defective heating, lighting, airing, sunning, and drainage of houses, with improper views as to air, clothing, bathing, and exercise, are the main causes."

The effect of change of location upon catarrhal affections seems very pronounced.

The committee asserts that a mere change of residence "from New York to Brooklyn, or from Brooklyn to New York, or accompanied with better food, more healthy and cheerful surroundings, may relieve a catarrhal patient; and that a change, with or without the above acquirements, from an exposed part of one city to a protected part of the other, from one house or section in either city to another house or section in the same, may likewise afford relief."

Those parts which are considered "exposed," in contra distinction from "protected" portions of a city, are those in which cold winds have more free access to exert their chilling effects.

Seaboard cities, though not, in general, considered favorable places of resort for catarrhal and consumptive patients, may yet afford benefit, provided the change is attended by increased comforts, enjoyment, better opportunities for treatment, and attention to personal hygiene.

Color Relations of Metals.

In a paper on the color relations of copper, nickel, cobalt, iron, manganese, and chromium, lately read before the Chemical Society, Mr. T. Bayley records some remarkable relations between solutions of these metals. It appears that iron, cobalt, and copper form a natural color group, for if solutions of their sulphates are mixed together in the proportions of 20 parts of copper, 7 of iron, and 6 of cobalt, the resulting liquid is free from color, but is gray and partially opaque. It follows from this that a mixture of any two of these elements is complementary to the third, if the above proportions are maintained. Thus a solution of cobalt (pink) is complementary to a mixture of iron and copper (bluish-green); a solution of iron (yellow) to a mixture of copper and cobalt (violet); and a solution of copper (blue) to a mixture of iron and cobalt (red). But, as Mr. Bayley shows, a solution of copper is exactly complementary to the red reflection from copper, and a polished plate of this metal viewed through a solution of copper salt of a certain thickness is silver white. As a further consequence, it follows that a mixture of iron (7 parts) and cobalt (6 parts) is identical in color with a plate of copper. The resemblance is so striking that a silver or platinum vessel covered to the proper depth with such a solution is indistinguishable from copper.

There is a curious fact regarding nickel also worthy of attention. This metal forms solutions, which can be exactly simulated by a mixture of iron and copper solutions; but this mixture contains more iron than that which is complementary to cobalt. Nickel solutions are almost complementary to cobalt solutions, but they transmit an excess of yellow light. Now the atomic weight of nickel is very nearly the mean of the atomic weight of iron and copper, but it is a little lower, that is, nearer to iron. There is thus a perfect analogy between the atomic weights and the color properties in this case. This analogy is even more general, for Mr. Bayley states that in the case of iron, cobalt, and copper, the mean wave length of the light absorbed is proportional to the atomic weight. The specific chromatic power of the metals varies, being least for copper. The specific chromatic power increases with the affinity of the metal for oxygen. Chromium forms three kinds of salts: Pink salts, identical in color with the cobalt salts; blue salts, identical in color with copper salts; and green salts, complementary to the red salts.

Manganese, in like manner, forms more than one kind of salt. The red salts of manganese are identical in color with the cobalt salts and with the red chromium salts. The salts of chromium and manganese, according to the author, are with difficulty attainable in a state of chromatic purity. He thinks these properties of the metals lead up to some very interesting considerations.—*Chemical Review.*

The Electric Lighting of Mines.

At one of the sessions of the American Institute of Mining Engineers, in Philadelphia, the Edison system of electric lighting, as applied to mining, was described by Mr. A. O. Moses. The method adopted is very simple. Wires run direct from the dynamo-electric machines to the different workings, supplying light to the shaft on their way. Each lamp may, if desired, be immersed in water, or may be protected from fracture by a coarse wire screen; the connections can all be made under water, and thus lamps may be put in or out of circuit without the slightest danger from the electric spark.

Far too much importance, the speaker thought, has been attached to the consequences that may arise from leading wires into mines for conveying electricity, notably by such high authority as Mr. Preece, the English telegraph engineer, but his deductions are not sustained by facts.

One of the most important advantages of the electric light in coal mines is in obviating the necessity of hermetically sealing up old or temporarily abandoned workings. Another is their prompt availability at times when light is of the most vital importance, when many lives may be in jeopardy after explosions, and dangers are multiplied on every hand, when everything depends upon immediate and vigorous action; then the weakness of all lamps that require to be fed with air asserts itself.

Dr. Wendell, Horticulturist.

Dr. Herman Wendell, one of the best known pomologists of this State, and owner of one of the largest orchards in the country, died at Hazlewood-on-the-Hudson, February 22, at the age of 70 years. Dr. Wendell was for several years President of the State Horticultural Society, and Vice-President of the State Agricultural Society. His orchard contained from eight to ten thousand fruit trees, every one planted by his own hand.

MECHANICAL INVENTIONS.

Mr. Albert Bonzon, of Santiago, Cuba, has patented a chronograph watch. The invention consists in a wheel rigidly attached to the second hand arbor and roughened on its upper surface, and in a heart cam with a roughened lower surface, which cam is loosely mounted on the second hand arbor and provided with a sleeve carrying the second hand and acted upon by a spring, whereby it can be raised or lowered, so as to come in and out of contact with the roughened wheel. An adjustment screw on the spring acting upon the cam regulates the distance that the end stud of this spring is removed from the heart cam.

Mr. William L. Miller, of Pittsburg, Pa., has patented a reversing and cut-off mechanism, which dispenses with the ordinary link motion. A disk is fitted and fixed on the shaft, and a movable eccentric having lugs which play in slots formed in the disk slides on the flat face of the disk. A sliding collar on the shaft is by links made to shift the eccentric, the weight of the eccentric being counterbalanced to equalize strain on the collar.

Messrs. Orry M. Shepard and William A. Knight, of Evansville, Indiana, have patented a railway time signal, which consists in a novel construction, arrangement, and combination of devices operated by wheels of a passing train, whereby both night and day signals are displayed, retained for a certain length of time in sight, and then gradually changed to different positions.

Mr. Luther C. Baldwin, of Manchester, N. H., has patented an apparatus for drying bobbins which dispenses with the use of boards for arranging the bobbins so that the ends will not touch after they have been painted. An endless belt is substituted on which the bobbins are placed, and which, running slowly, discharges the bobbins at a distance from the point where they are placed on the belt. The paint used being of a kind which quickly dries, the bobbins are discharged finished. A registering apparatus is employed to record the number of bobbins so discharged.

A Railway Station in the Gothard Tunnel.

The daily journals of Switzerland and Germany contain long articles in regard to an underground station in the great Gothard Tunnel, below the village of Andermatt, which has about 800 inhabitants, is situated about 5,000 feet from the sea, and directly over the tunnel. The Gothard Pass and the well-known Furka Pass, leading into the valley of the Rhone, cross here, and it seemed desirable to connect the railroad with the Furka Pass. The design is to cut a slanting tunnel from Andermatt down to the Gothard Tunnel and convey the passengers up and down by means of a wire cable road. At the connections of the two tunnels, restaurants, depots, etc., are to be cut out of the rock. The inhabitants of Andermatt expect to do a very great business, as all the passengers will prefer to leave the train at this novel station and be carried into the beautiful Urserenthal, in which Andermatt is located, by the rope railway. The freight traffic would certainly be increased, but all this will probably not pay the cost of the additional tunnel, which would have to be about 1½ miles long. The idea is a very novel one, and is no doubt deserving of some consideration, but at present it will probably remain idea only.

L. d. V D. E.-V.

Long Voyage in a Small Boat.

According to a correspondent of the London *News*, the sailing boat Il Leone di Caprera, 3¼ tons register, and manned by three Italians, stopped at Las Palmas, Canary Islands, February 9, on the way from Montevideo, S. A., to Naples. The boat had been 95 days on the voyage. She is described as being 27 feet long, 7½ feet wide, 3 feet deep in the center, and 5 feet fore and aft, flush deck, with bulwarks 2½ inches high. In the after part of the boat is a small semicircular space 3 feet deep, in which the helmsman sits. The hold, which is fitted with a number of hermetically sealed zinc tubes, 10 inches in diameter, capable of floating 40 tons, is entered by a hatchway in the after part of the vessel, close up to the semicircular space before mentioned. Here their provisions and water are stored, and there is just enough space to allow one man to lie down at full length. The planks are of cinnamon wood, and the framework is made of algarroba (carob tree.) The two masts are of walnut wood, and fitted in such a manner that in case of a sudden squall they can be lowered almost instantaneously. When in 48° longitude and 30° latitude the boat was struck by a heavy squall, and was thrown on her beam ends, the tops of the masts being forced two or three inches under the water, but she raised herself almost instantly, and suffered no damage. The commander was Capt. V. Fondacaro, an experienced navigator.

An Illustration of Amœboid Movements.

The curious movements of the lowest forms of life are illustrated by Dr. Haycraft with a simple mechanical contrivance, which will be found useful in the classroom. He takes an India-rubber ball, perforated with a number of small holes, fills it with colored albumen (white of egg), and immerses it in a solution of sugar of about the same density as the albumen. A gentle pressure applied to the ball forces out the albumen in finger-like processes, which are retracted when the pressure is relaxed, thus clearly imitating the extension and retraction of the amœboid processes of protoplasm familiar to all microscopists.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Sight: An Exposition of the Principles of Monocular and Binocular Vision. By Joseph Le Conte, LL.D., author of "Elements of Geology," etc. "International Scientific Series." With illustrations. 12mo. cloth. Price, $1.50. D. Appleton & Co., Publishers, 1, 3, and 5 Bond Street, New York.

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa.

The Twin Rotary Pump. See adv., p. 140.

For Mining Mach'y, see adv. of Noble & Hall, p. 172.

Carpenter's Tool Patent for sale. See adv., p. 190.

Silica Paints (not mixed); all shades. 40 Bleecker St., N. Y.

Geiser's Patent Grain Thrasher and Separator; Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Wanted—Steam Engine, 150 to 200 H P.; must be first-class. Address Baugh & Sons, Philadelphia.

13,000 Battery Carbons, 2½ x 4½ inches, wanted immediately. Send sample with estimate. J. Pusey, P. O. Box 2008, Philadelphia, Pa.

Van Beil's "Rye and Rock" is acknowledged to be the best remedy for lung and throat diseases.

$600.—Entire Patent Valuable Household Article. H., Station F., Philadelphia, Pa.

A man well established in business, but having some leisure, would like to handle a specialty on commission. Address Box 6, Journal Office, Providence, R. I.

Avoid the expense and evils attending the use of compounds in your boiler. Remove the sediment contained in feed water at small cost by Hotchkiss' Mechanical Boiler Cleaner. Circulars free. 84 John St., New York.

Heavy Lathe, 7 ft. swing, 16 ft. bed.; Steam Hammer; Heavy Geared Hoisters; Double Cylinder Propeller Engine, 26 x 26; Portable Hoister; Engines, Boilers, Boiler Makers' and Machinists Tools. 22 East, near Delancey St., New York city.

Foreman wanted for Machine Shop. A thorough mechanic, competent to manage men. Satisfactory references required. B. W. Payne & Sons, Corning, N. Y.

Wanted—Mechanical Draughtsmen. None but thoroughly practical men need apply. S. S. Hepworth & Co., 11th Ave. and 27th St., New York.

Gear Wheels for Models, etc.; brass or iron. New list free. Discount to dealers. Grant, 4 Alden St., Boston.

Lightning Screw Plates and Labor-saving Tools, p. 125.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Telephone and Call Bell, complete set, only $3. Model Novelty Co., Boonton, N. J.

Wanted—10 or more Iron Cars, suitable for drying purposes, holding about one ton each. Address Baugh & Sons, Philadelphia.

For Machinists' Tools, see Whitcomb's adv., p. 173.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. C. Toope & Co., M'f'g Agt., 353 E. 78th St, N. Y.

For Light Machinists' Tools, etc., see Reed's adv., p. 156.

Large Slotter, 72" x 18" stroke. Photo on application. Machinery Exchange, 261 N. 3d St., Phila.

Buy the Buffalo Port. Forge. Have no other.

The Inventors' Institute, Cooper Union, New York. Sales of patent rights negotiated and inventions exhibited and advertised for subscribers. Send for circular.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, successor to Bliss & Williams, Brooklyn, N. Y.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 226 Walnut St., Philadelphia, Pa.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Lea Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Peck's Patent Drop Press. See adv., page 174.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Burgess' Portable Mechan. Blowpipe. See adv., p. 140.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Wren's Patent Grate Bar. See adv. page 173.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Eclipse Portable Engine. See illustrated adv., p. 158

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 158.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 158.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Machinists' Tools and Special Mach'y. See adv., p. 173.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Brass & Copper in sheets, wire & blanks. See ad. p. 173

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Saunders' Pipe Cutting Threading Mach. See p. 173.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Saw Mill Machinery. Stearns Mfg. Co. See p. 141.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 142.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 141.

The Sweetland Chuck. See illus. adv., p. 141.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N. J.

Eagle Anvils, 10 cents per pound. Fully warranted.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For best Indirect Radiators, see adv., page 173.

Steam Cylinders bored from 3 to 110 inches. L. B. Flanders Machine Works, Philadelphia, Pa.

Houston's Four-Sided Moulder. See adv., page 173.

The Student's Illustrated Guide to Practical Draughting. By T. P. Pemberton. Sent on receipt of price, $1. Address T. P. Pemberton, 5 Dey St., Room 13, New York.

New Economizer Portable Engine. See illus. adv. p. 173.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 172.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

The I. B. Davis Patent Feed Pump. See adv., p. 141.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Send ten cents for Vick's Floral Guide. See adv., page 140. James Vick, Rochester, N. Y.

Clark Rubber Wheels adv. See page 172.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. S. M. writes: In the last SCIENTIFIC AMERICAN in answer to J. S M., in regard to reboring the cylinder, or grinding with segment of lead and sand or emery, I will ask if it is not possible to wear the cylinder smooth by constant use, keeping the packing set slack and keeping it well lubricated with good oil mixed with good plumbago, the cylinder being quite soft? I know of one case where a cylinder became cut quite bad on opposite sides by the piston rod being bent on account of one of the follower bolts working out. This cylinder became smooth in about four months of running twelve hours each day, without any special care on account of its being cut. This case makes me think that a cylinder that has become cut in one or two places might, with extra good care, be made to wear smooth. What is your opinion in the case? You have told me already that the only safe way was to rebore the cylinder, and I think it is; but if it is possible to wear it out I would like to do so. The diameter is 22 inches, being cut in one place about 5 inches wide, whole length of stroke 20 inches. A. We think that with care it might be accomplished in the way you propose, but the process must necessarily be slow, as all other parts of the cylinder must be worn or abraded to a diameter sufficiently large to remove the metal to the depth of the cuts.

(2) W. L. asks: How much stiffer would a wrought iron pipe, 4 inches in diameter and ⅛ inch thick, be, than a pine stick 8 inches in diameter, both to be 10 feet long? A. The pipe would be about 3½ times stiffer than the wood.

(3) O. P. S. asks: 1. What is the best preparation that I can use to ebonize or blacken parts of a light-colored ash wood, used for furniture, the preparation to be applied with a brush? A. See page 91, (18), vol. xl., SCIENTIFIC AMERICAN. 2. Will a simple rotary fan blower, 6 inches in diameter, with the wings 2½ inches across, be sufficient to run a sand blast, and what would be the greatest speed to get the strongest blast? A. Such a fan will do. It should run at from 2,500 to 3,000 revolutions per minute.

(4) H. F. W. writes: 1. In the description of Elisha Gray's electro-harmonic telegraph, in No. 27, vol. xliii., it says that the steel reeds are operated by electro-magnets, and "the current, operating one reed when passed over a line, will set in motion at the farther end a reed exactly corresponding to the first," etc. Why is not one reed set in motion by the current as much as another? A. A reed will answer only to electrical impulses corresponding in rapidity with its period of vibration. 2. Has any motor been invented to use simply the power of a permanent magnet? A. No.

(5) J. P. F. asks: 1. Where can I procure a good cylinder air pump? A. From any good metal pump maker. See our advertising columns. 2. What would be the weight of one square foot of steam, at a density of 140 lb. to the square inch? A. One cubic foot, 155 lb., total pressure = 0·00348 lb.

(6) H. A. M. writes: A maintains that white is a color. B says that white is not a color. Is white a color considered in the same sense as green or yellow, etc.? A. White is popularly considered as a color, but in reality it is the union of all colors.

(7) J. L. K. writes: 1. I want to bring water to a turbine wheel, a distance of 800 feet, fall 60 feet, size of pipe about 15 inches. I propose using 500 feet of pipe and 300 feet open race. Can I make a substantial pipe of 3 inch plank, and how should I construct it? A. Yes; make the pipe with staves, hooped with wrought iron band. The lower end must of course be hooped closer than the upper end. 2. What power do I require to drive a two-block shingle machine, self-feeding saw, making 1,500 revolutions per minute, and cutting half an inch each revolution? A. About six horse power.

(8) J. W. H. asks: 1. How much power is required to run a 24-inch saw to cut or split hardwood plank from 3 to 4 inches thick? A. T. power does not depend upon the size of the saw, but upon the amount of work to be done; and, as you do not state this, we can give you only a general reply. With a kerf of one-eighth inch, 1 horse power will saw 2·66 square feet per minute. 2. Which is the best steam engine, one with large cylinder and short stroke, or a smaller cylinder and longer stroke, both to be of the same horse power? A. For high speed short stroke, and for slow speed long stroke. 3. Which is the best, the upright or the horizontal—the engines not to exceed 15 horse power? A. There is very little choice; the upright occupies the least room.

(9) C. N. F. asks: 1. How can water be kept in casks for fire purposes in mills, in winter, without freezing? A. I have used salt, but it don't seem to be a sure preventive. A. Salt will answer very well if you use enough of it.

(10) J. W. B. writes: I want to plate table cutlery with Banca tin, by melting the tin in a crucible, and dipping the articles to be plated. How shall I prepare the solutions to be used before and after the dipping, so that no polishing will be necessary? A. Cleanse by dipping in a mixture of equal parts muriatic acid and water, and scouring with a brush and fine sand or pumice stone; rinse quickly in running water, and put into a bath of hot melted tallow for half an hour, then for an hour in the molten tin at about 435° Fah. On removal dip in very hot tin, and remove all superfluous metal with a brush of hemp. Dip again in a very hot bath of purest tin, and transfer at once to a bath of hot oil, where excess of the metal drains off. On removing dip the edges in the hot tin to take off the thick border. Finally rub with dry bran until the oil is removed and the work presents a silvery gloss.

(11) W. S. asks (1) how to obtain a pure or nearly pure carbon gas. A. We do not know what you mean by carbon gas. 2. Can a vessel containing said gas be heated to redness without danger? A. Illuminating or similar hydrocarbon gas, or vapor of petroleum oils, et ., if unmixed with air, may be passed through red hot iron tubes without danger. Owing to the expansion caused by heat it would not be safe to heat such a gas in sealed vessels. 3. Can carbon be made a non-conductor of electricity, and if so, will it retain its infusible properties? A. The diamond (pure crystallized carbon) is practically a non-conductor of electricity, and infusible; the other forms afford a passage to the current. The conversion of these latter into the crystalline form has not yet been accomplished in a practical way. 4. Will kaolin withstand the heat of incandescent carbon of ordinary lamps (say Edison's)? If not, is there any substance, a non-conductor, that ...? A. Not very well; you might try pure caustic lime or magnesia.

(12) G. G. asks: Is there any way to prepare India ink so that it will not gum or harden? If so, please inform me how to do it. A. Dilute Cooper's liquid glue with about six parts of water, mix into a perfectly smooth thick paste, with the finest purified vegetable lampblack: mould and dry slowly.

(13) G. G. P. writes: I am at a loss for a mordant for dyeing pearl buttons either blue or red. Can you assist me? A. Use a strong alcoholic solution of aniline blue or red; dry, and rub down with cork moistened with oil of vitriol.

(14) C. C. asks: 1. Can I soften celluloid so I can press it into a plaster cast of a wood engraving and then print from it as from a stereo or electrotype? A. Yes, by steam and pressure; also by means of a hot oil bath. 2. Where can celluloid be bought, and cost per sheet or lb.? A. See our advertising columns and Hints to Correspondents. 3. Where can bisulphide of carbon be obtained in small quantities, say 1, 2, or 3, oz., and cost per oz.? It cannot be had here or in Denver. A. Your druggist can doubtless procure it for you; costs about 40 cents a pound. 4. Can electrotypes be produced with the dynamo electrical machine? A. Yes. 5. Can you explain how engravings on wood are made to look similar to pencil drawings and lithographs, as seen in *Scribner*, *St. Nicholas*, *Wide Awake*, and the Jersey bull, in this week's SCIENTIFIC AMERICAN (February 5); show shape of tools? A. The plates are prepared by the photo-engraving process. See printing by photography, SUPPLEMENTS, Nos. 143 and 146. 6. Where can the tools be bought? A. See answer No. 2. 7. Give parts of hydrofluoric acid and parts of water for etching on glass. A. Use ordinary strong hydrofluoric acid, or powdered fluorspar, made into a paste with strong sulphuric acid slightly warmed.

(15) W. P. D. asks: What is the best mixture to apply to iron shaft and castings to protect them from dilute acids? A. Clear lard, 1 lb.; camphor, ½ oz.; melt together and mix with enough blacklead to color. Clean the parts and coat thoroughly with this.

(16) O. C. asks: Can you inform me of any process by which eggs can be prevented from spoiling and kept in a reasonably fresh state, say from April to January? I have tried some pickling process but not with success. A. One of the best means of preserving eggs is the following: Select good fresh eggs and pack endwise in a mixture of equal parts of fine dry charcoal and salt (cold). Keep in a cool dry place, until required for use. A thin coating of gum or a trace of oil will prevent loss of moisture through the shell.

(17) A. E. N. asks: How is the sensitive paper used for taking blue prints (photographic) prepared? A Ferricyanide, 1 oz.; ammonio-citrate of iron, 1 oz.; water (distilled), 10 oz. Both the ferricyanide and citrate must be chemically pure. Dissolve the former in six ounces of the water and the latter in the remainder. Mix the solutions together, put into a shallow porcelain dish. Float the sheets of paper on the surface of the liquid, raising the corners alternately to drive out air bubbles. Hang up by one corner in a dark place to dry. After exposing to sunlight behind the design or drawing, wash immediately and thoroughly in running water to remove all unchanged chemicals.

(18) C. E. S. asks for a process for tinning malleable cast iron. The acid used to tin wrought iron will not do for malleable iron. I have tried it without success. A. Do not leave in the acid or bran too long; scour thoroughly with fine sand (and a wire brush where it can be used), and pass through the following solution before entering to the grease pot: Ammonia alum, 11 oz.; fused protochloride of tin, ⅛ oz.; water, 4½ gallons; heat to boiling.

(19) T. H. C. asks: What kind of a machine is used for emerying those iron or steel ramrods used in the army guns? A. We believe an emery belt is commonly used for this purpose.

(20) R. J. W. writes: I have several boilers in this section of the country receiving their water from driven wells. The water is perfectly clear, is good to drink; but when used in a boiler to make steam it forms a froth or scum on top of water. How can I get rid of it? It will not sink so that I can blow it out of mud drum. Will a surface blow-off answer, by putting the pipe from top of boiler down to water line? A. Use a surface blow-off valve with a scum pipe inside the boiler.

(21) F. M. W. asks: Please explain how I can make gas bags in some cheap way, that will hold enough oxygen and hydrogen gas to run a magic lantern for two or three hours without filling again? A. Gum caoutchouc, 1 part; benzole, 20. Warm the latter over hot sand (out of doors), and gradually add the former, cut in fine shreds. Let it stand, with occasional stirring, until solution is complete. Give fine cotton ducking two coats of this (on one side), letting the first become nearly dry before laying on the second. Place two of these pieces, cemented faces together; go over the double piece (both sides) with a hot iron, and expose to the air for a week, to dry. Having prepared enough of this double cloth, stitch together with strong linen thread to form a wedge-shaped bag; give the seams several coats of the cement, thinned somewhat with benzole, and seal in the stop cock with the same. With an ordinary oxyhydrogen jet and quarter lb. pressure per inch you will require at least 15 feet of oxygen gas and about twice as much hydrogen (pure hydrogen). A "wedge" bag, 4½x4x? feet, will hold sufficient oxygen.

(22) S. C. asks for the process of making chloride of lime in small quantity. A. Paint with asphaltum dissolved in oil of turpentine the inside of a long shallow box, all the cracks of which have been previously stopped with putty. When this is dry sprinkle the bottom of the box with slaked lime just moist, to a depth of half an inch. At one end place a stoneware jar half filled with a mixture of 6 parts black oxide of manganese, 8 parts salt, mixed with 20 parts of water. Then stir in 13 parts of oil of vitriol (which will heat the water nearly to boiling). Set on the cover tightly at once and let it alone for twelve hours. The lime will be found sufficiently chlorinated for use. The box should be kept out of doors. Avoid inhaling the chlorine gas. Usually it is very much cheaper to purchase than to make small quantities of bleaching powder.

(23) F. M. J. asks: 1. Cannot a small electric lamp for an ordinary room be furnished with light from a battery run by clockwork, similar to Edison's, but on a small scale, that would be an improvement on the ordinary kerosene lamp, the lamp to be stationary or otherwise. A. A one light machine could doubtless be constructed, but the clock work motor would hardly prove practicable. Small dynamo machines are not as economical as large ones. 2. Please explain the *modus operandi* of clarifying the crude oil kerosene as we receive it at 150 test. A. Agitate with about 3 per cent of oil of vitriol, then with plenty of water, and finally with water containing a trace of soda. 3. I find "aluminum gold" jewelry advertised—warranted to keep color and not distinguishable from gold, even by experts. Is the metal what it is represented to be? A. Aluminum bronze can be made to closely resemble gold in appearance. Experts can easily distinguish the alloy from gold.

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(24) W. T. asks how to make asphalt pavements or walks. Are they expensive? Where can the material be obtained? Is it durable? What is the best mixture for walks that will stand hard usage? A. Ordinarily gravel screened to various sizes is stirred up with asphaltum liquefied by heat until the pebbles become well coated with the material. The road bed having been excavated to a depth of 6 or 7 inches and walled at the sides with inch planks, a layer of the coarser gravel is laid down and compacted by heavily rolling. Other layers of tarred gravel grading to fine sand at the surface are then put down in a similar manner. These walks are much cheaper than flagging, but they do not stand the weather in this climate very well. Good hydraulic cement mixed with about twice its weight of very fine sharp quartz sand and one one-hundredth part of silicate of soda dissolved in water makes a good walk when properly hardened. For materials see our advertising columns.

(25) T. H. S. asks: Can you inform me if there is any paint or other material which can be depended upon to make a wooden cistern watertight? If cement is used will it adhere better to brickwork than to wood? A. Try the following: 1. Boiled linseed oil, 3 parts; asphaltum, 4 parts; rosin, 12 parts. Melt and stir together over a gentle fire for an hour. Try a sample by cooling under water; if not sufficiently firm add more asphaltum and resin. Apply to the dry wood hot (not too hot). 2. Litharge, plaster of Paris, and dry white sand, each 10 parts by measure powdered; 1 part finely powdered resin. Mix into a stiff paste with warm boiled oil. Use at once and give three days to harden before wetting.

(26) J. M. A. writes: The front glass of my aquarium, one-sixteenth inch thick, 13x28, has cracked across the narrow part. There is no support for the top of the glass, but a strip is laid on. How can it be made secure without trouble of replacing the glass? The fracture is very neat, so that it scarcely leaks. A. Clean the glass with a little soda, and cut a piece of thin glass an inch wide and as long as the crack. Smear both glasses with the following warm solution: Fine isinglass and gelatine, each 1 drachm; bichromate of ammonia, 12 grains; water, 2 ounces; filter. Slide one glass upon another so as to carry off all but a film of the cement, which exposure to light soon renders perfectly insoluble in water.

(27) J. A. B. asks: What is the process for making the article called pumpkin flour? A. The cleaned and pulped fruit is dried by exposure to currents of warm dry air, then ground in a mill.

(28) G. B. asks for directions for embossing designs on glass ware, that is, goblets and shade globes. We understand the work is printed on by impressions taken off brass plates, then transferred to paper and from that to the glass, and then the glass is put in a bath containing white acid. A. Print from engraved plates on soft paper and immediately place the printed paper smoothly on the glass to dry. Moisten the back of the paper with a sponge, when it will come off, leaving the design on the glass. Then dip the surface in hydrofluoric acid until properly etched, rinse in water, and take off the fatty design by soaking in benzole.

(29) T. C. asks: What is the composition of the charges used for charging small fire extinguishers? A. The vessel is partially filled with a saturated aqueous solution of bicarbonate of soda. Over the liquid, near the top of the vessel, is suspended a lead bottle of oil of vitriol, in such a manner that when its stopper is withdrawn by pulling up the rod at top the bottle inverts and the acid is thrown into the bicarbonate solution.

(30) H. S. C. asks how to make and apply self-luminous or calcium sulphide paint. A. Boil together for an hour 2¼ oz. caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. of pure sulphur (floured) and a quart of soft water. Set aside in a covered vessel for a few days, then pour off the liquid, collect the clear orange colored crystals which have deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clean black lead crucible provided with cover. Heat for half an hour at a temperature just short of redness, then quickly for about 15 minutes at a white heat. Remove cover, and pack in clay until perfectly cold. The addition of a small quantity of pure calcium fluoride to the sulphide before heating it is made. It may be mixed with alcoholic copal varnish.

(31) E. I. asks: 1. How can I make a lacquer for polished brass, etc. Can it be purchased? How is it applied? A. Seedlac, dragon's blood, annatto, and gamboge, each 4 oz.; saffron, 1 oz.; spirits of wine, 10 pints. Put all together in a covered vessel and stand the vessel in hot water and stir the contents occasionally until dissolved. Such lacquers are purchasable. Lacquering is done in two ways, called hot and cold lacquering. In the latter the lacquer is laid on evenly with a camel's hair brush, and the work is then placed in an oven or on a hot stove for a few minutes to set the lacquer. If heated too strongly the lacquer is discolored; if not enough it does not set properly. By the first method the metal is heated to the temperature of a flat iron as used by the laundress, and the lacquer is quickly brushed over it in this state, the work being subjected to the heat of an oven after or not, according to the judgment of the lacquerer. The article, if very small, will require this, because it will have parted with much of its heat in laying on the lacquer. If heavy, it will retain sufficient to perfect the process. A knowledge of the exact degree of heat required can only be attained by experience. 2. What is the best article to polish small tin articles about the size of a button? We have a good many of these to do. A. Use a small circular scratch brush attached to a lathe. 3. How can we gild cheaply? A. See article on electro-gilding, page 116, current volume.

(32) N. P. H. asks: What will make a glue that will be strong and yet be thin? A. Heat the solution for some time in a Papin's digester at 300° Fah.

(33) W. P. M. asks for the best method of coating sheet iron pans to keep them from rusting. I want some cheap varnish. A. Asphaltum, 5 parts; fine black lead (graphite), 1 part. Dissolve the asphaltum in oil of turpentine and stir in the graphite.

(34) E. E. W. asks (1) if the telephone, in SUPPLEMENT 142, will work five miles on No. 12 wire. A. If well made it would probably work through that distance, but the sound would necessarily be weak. Better results are obtained by using some form of transmitter. 2. How are the insulators attached to the bracket, or, in other words, what is the composition used to fasten or glue them on? A. The insulators are generally screwed on the brackets, an internal thread being formed in the insulator for that purpose.

(35) A. J. K. asks: What can be added to fluid ink made of gall and iron to make it jet black at first writing? Having night work I cannot see the writing until next day, when it then turns black. Does it injure the writing by any addition, and will it be as thin as before the addition is made? A. Try the addition of a small quantity of fine logwood extract dissolved in a little hot water.

(36) W. H. S. asks: 1. When do water pipes burst, when freezing or when thawing? A. In freezing. 2. Does water when forming into ice contract or expand? A. It expands. See Tyndall's "Heat a Mode of Motion."

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. W.—It is a light fine silicious sandstone. Useful for some polishing purposes.—A. L. C.—The sediment is composed chiefly of a fine micaceous clay and sulphate of lime. Not specially injurious to cattle or steam boilers.—T. B. T.—A good marl—useful for fertilizing purposes. Its marketable value can only be determined by an analysis.—L. H. D.—Hornblende.—W. B.—The metal is iron and iron protosulphide. The shale contains much carboniferous matter, but no graphite.—A. U. G.—It is hornblende-schist—of little value.—T. E. T.—Mica schist—of no commercial value.—E. M. B., Jr.—1. Copper glance—sulphide of copper and iron pyrites—sulphide of iron. 2. Pyrrhotine—magnetic iron pyrites—may contain a little nickel. 3. Impure limonite—brown hematite iron ore.

COMMUNICATIONS RECEIVED.

On a Lunar Halo. By L. B. O.
On a Parhelion. By D. H. D.
On a Lunar Halo. By J. D. H.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 15, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Sign, Holdsworth & Pringle 237,806
Skate, E. L. Gilman 237,857
Sleigh seat, upholstered, F. Selle 237,707
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Sofa, V. Rathknecht 237,774
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Steam engine reversing gear, C. Straub 237,925
Steam trap, J. Ponder 237,698
Steel strips, apparatus for grinding and tempering, H. A. Kimball 237,754
Stove, gas or vapor, J. Benbow 237,672
Stove, heating, J. W. Wright 237,714
Stoves, vapor burner for, Z. Davis 237,826
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Telephone, A. K. Eaton 237,838
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Telephones, transmitter for speaking, W. Gillett. 237,856
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Valve, balance, J. H. Greenwood 237,742
Valve, stop, J. Old 237,769
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Washstand, N. O. Bond 237,723
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Water meter, J. B. Curry 237,677
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Sink, W. C. Peet 12,173
Stove, cooking, Keeley & Atchison 12,166
Stove, parlor, G. Smith 12,174

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Gloves, kid, C. T. Jones 8,164, 8,165
Hair dressing, S. R. Van Duzer 8,167
Medicated garters, E. S. Creighton 8,162
Medicines, certain proprietary, Heil & Hoelke 8,163
Tea, H. J. Weston 8,168

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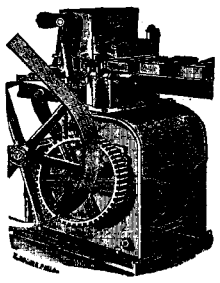

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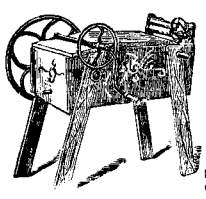

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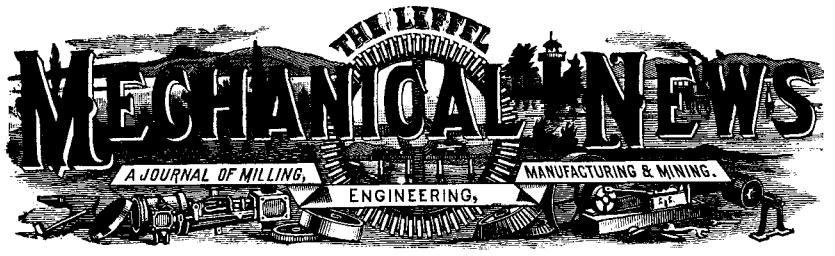

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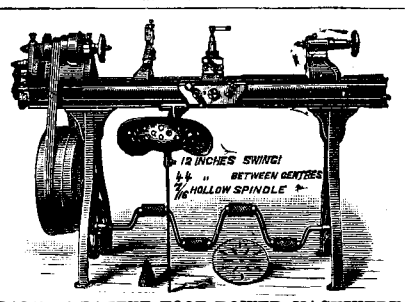

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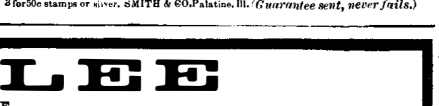

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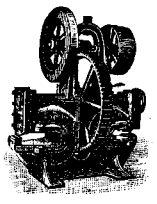

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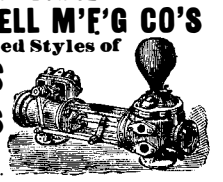

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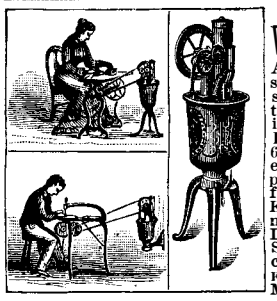

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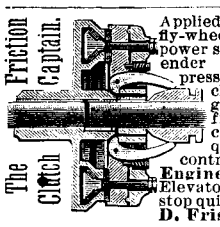

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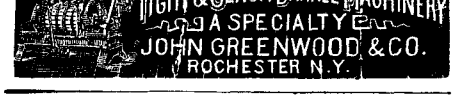

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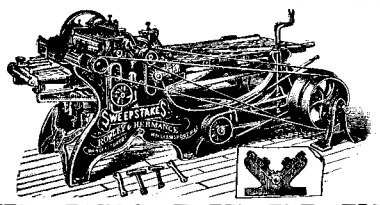

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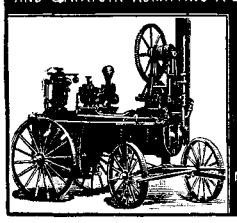

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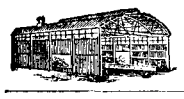

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THIRTY-SIXTH ANNUAL REPORT

OF THE

New-York Life Insurance Co.

OFFICE, Nos. 346 and 348 BROADWAY.

JANUARY 1, 1881.

Amount of Net Cash Assets, January 1, 1880.....$38,185,431.68

REVENUE ACCOUNT.

Premiums	$7,014,819.59		
Less deferred premiums Jan. 1, 1880	367,989.02	—$6,646,830.57	
Interest and rents, (including realized gains on real estate sold)	2,635,877.95		
Less interest accrued Jan. 1, 1880	317,989.11	— 2,317,888.84	—$8,964,719.41
			$47,150,151.09

DISBURSEMENT ACCOUNT.

Losses by death, including Reversionary additions to same	$1,731,721.37	
Endowments matured and discounted, including Reversionary additions to same	564,579.85	
Annuities, dividends, and returned premiums on cancelled policies	2,203,590.02	
Taxes and re-insurances	212,424.06	
Commissions, brokerages, agency expenses and physicians' fees	770,804.30	
Office and law expenses, salaries, advertising, printing, &c	322,910.64	—$5,806,030.24
		$41,344,120.85

ASSETS.

Cash in bank, on hand, and in transit (since received)	$852,028.10	
Invested in United States, New York City, and other stocks, (market value $16,764,988.05)	14,925,174.09	
Real estate	5,029,324.59	
Bonds and mortgages, first lien on real estate, (buildings thereon insured for $15,365,000.00 and the policies assigned to the Company as additional collateral security)	16,464,922.23	
Temporary loans, (secured by stocks, market value, $3,184,840.00)	2,491,000.00	
* Loans on existing policies, (the reserve held by the Company on these policies amounts to $2,975,000)	597,451.12	
* Quarterly and semi-annual premiums on existing policies, due subsequent to Jan. 1, 1881	387,972.13	
* Premiums on existing policies in course of transmission and collection (estimated reserve on these policies $440,500, included in liabilities)	204,852.99	
Agents' balances	34,228.23	
Accrued interest on investments Jan. 1, 1881	357,167.37	—$41,344,120.85
Excess of market value of securities over cost		$1,839,813.96

* *A detailed schedule of these items will accompany the usual annual report filed with the Insurance Department of the State of New York.*

CASH ASSETS, Jan. 1, 1881.....$43,183,934.81

Appropriated as follows:

Adjusted losses, due subsequent to Jan. 1, 1881	$335,195.40
Reported losses, awaiting proof, &c	198,761.98
Matured endowments, due and unpaid, (claims not presented)	109,643.96
Annuities, due and unpaid	5,294.25
Reserved for re-insurance on existing policies; participating insurance at 4 per cent Carlisle net premium; non-participating at 5 per cent. Carlisle net premium	36,473,691.79
Reserved for contingent liabilities to Tontine Dividend Fund, over and above a 4 per cent. reserve on existing policies of that class	1,752,165.82
Reserved for premiums paid in advance	14,084.62
	$38,888,837.82

Divisible Surplus at 4 per cent.....$4,295,096.99

Estimated Surplus by the New York State Standard at 4½ per cent., over $9,000,000.00

From the undivided surplus of $4,295,096 the Board of Trustees has declared a Reversionary dividend to participating policies in proportion to their contribution to surplus, available on settlement of next annual premium.

During the year 6,946 policies have been issued, insuring $22,229,979.

Number of Policies in force	Jan. 1, 1877, 45,421. Jan. 1, 1878, 45,605. Jan. 1, 1879, 45,005. Jan. 1, 1880, 45,705. Jan. 1, 1881, 48,548.	Amount at risk	Jan. 1, 1877, $127,748,473. Jan. 1, 1878, 127,901,887. Jan. 1, 1879, 125,232,144. Jan. 1, 1880, 127,417,763. Jan. 1, 1881, 135,726,916.
Death-claims paid	1876, $1,547,648. 1877, 1,638,128. 1878, 1,687,676. 1879, 1,569,854. 1880, 1,731,721.	Income from Interest	1876, $1,906,950. 1877, 1,867,457. 1878, 1,948,665. 1879, 2,033,650. 1880, 2,317,889.
Divisible Surplus at 4 per cent.	Jan. 1, 1877, $2,626,816. Jan. 1, 1878, 2,664,144. Jan. 1, 1879, 2,811,436. Jan. 1, 1880, 3,120,371. Jan. 1, 1881, 4,295,096.		

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THEODORE M. BANTA, Cashier.
D. O'DELL, Superintendent of Agencies.
CHAS. WRIGHT, M. D., HENRY TUCK, M. D } Medical Examiners.

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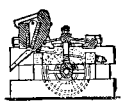

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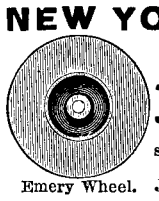

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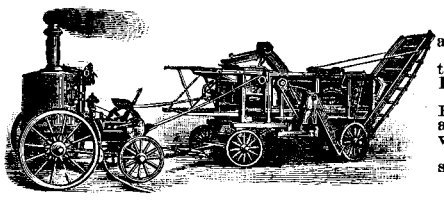

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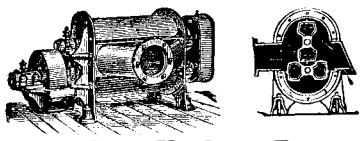

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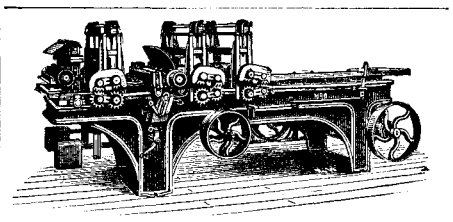

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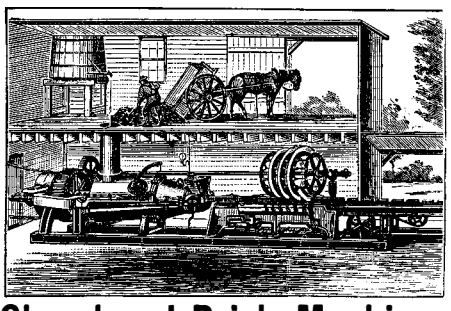

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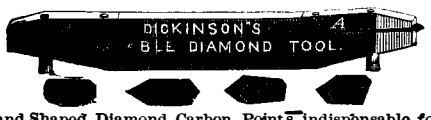

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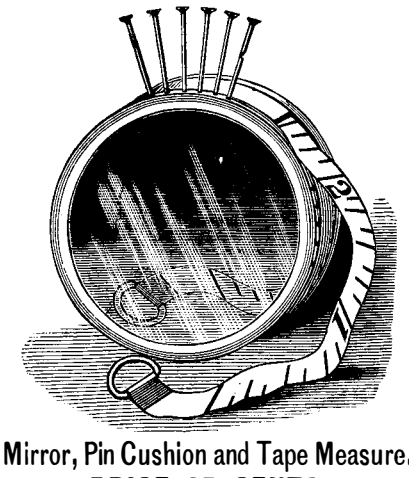

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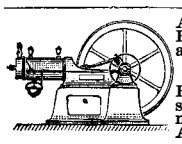

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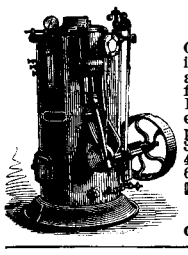

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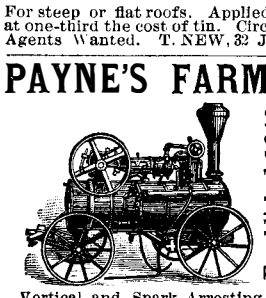

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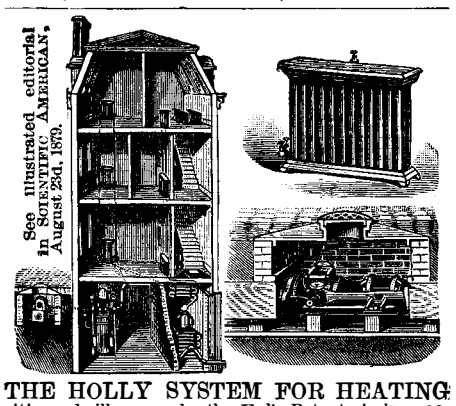

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